

# **AGENCY APPROVAL DRAFT**

## **Surface Sediment Field Sampling Plan**

**Portland Harbor Pre-Remedial Design  
Investigation and Baseline Sampling  
Portland Harbor Superfund Site**

AECOM Project Number: 60554349  
Geosyntec Project Number: PNG0767A

March 29, 2018

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## CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



March 29, 2018

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Kenneth M. Tyrrell  
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Date

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## ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
AECOM	AECOM Technical Services
ALS	ALS Environmental in Kelso, Washington
ASAOC	Administrative Settlement Agreement and Order on Consent
ASTM	American Society for Testing and Materials
BL	baseline/stratified random samples
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COCs	contaminants of concern
CRD	Columbia River Datum
CSM	Conceptual Site Model
D/U Reach	the Downtown Reach and the Upriver Reach
DDx	dichlorodiphenyltrichloroethane and its derivatives
D/F	dioxins/furans
DGPS	differential global positioning system
DQOs	data quality objectives
DSL	Oregon Department of State Lands
EPA	United States Environmental Protection Agency
FC	Field Coordinator
FS	feasibility study
FSP	Field Sampling Plan
Geosyntec	Geosyntec Consultants, Inc.
Gravity	Gravity Marine Services
ID	identification number
LWG	Lower Willamette Group
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PDI	Pre-Remedial Design Investigation
PHSS	Portland Harbor Superfund Site
Pre-RD AOC Group	Pre-Remedial Design AOC Investigation Group
Pre-RD	Pre-Remedial Design
PRP	potentially responsible party
PSEP	Puget Sound Estuary Program
QA	quality assurance
QAPP	Quality Assurance Project Plan

QC	quality control
QC	quality control
RB	rinsate blank
RI	remedial investigation
RM	river mile
ROD	Record of Decision
SG	surface sediment grabs
Site	Portland Harbor Superfund Site
SMA	sediment management area
SOP	Standard Operating Procedure
SOW	Statement of Work
SWAC	surface weighted average concentration
TB	trip blank
TestAmerica	TestAmerica Laboratories
TOC	total organic carbon
UR	D/U Reach samples

# **1. INTRODUCTION**

The Record of Decision (ROD) described a post-ROD sampling effort for the Portland Harbor Superfund Site (Site or PHSS; Figure 1) located in Portland, Oregon, to delineate and better refine the sediment management area (SMA) footprints, refine the Conceptual Site Model (CSM), determine baseline conditions, and support remedial design (United States Environmental Protection Agency [EPA] 2017a). Geosyntec Consultants, Inc. (Geosyntec), and AECOM Technical Services (AECOM) submitted a detailed Work Plan for Pre-Remedial Design Investigation and Baseline Sampling (PDI) on behalf of a group of industrial parties called the Pre-Remedial Design Agreement and Order on Consent Investigation Group (Pre-RD AOC Group). On December 19, 2017, EPA entered into an Administrative Settlement Agreement and Order on Consent (ASAOC) with the Pre-RD AOC Group to conduct the PDI studies at the Site (EPA 2017b). The ASAOC includes a Statement of Work (SOW) and the PDI Work Plan (as an attachment to the SOW), which generally describe the agreed upon field investigation activities, data analyses, schedule, and deliverables for the PDI.

These PDI studies are a foundational step in what will be a multi-phase effort to update current conditions from the collection of data during the remedial investigation (RI)/feasibility study (FS). The RI/FS was initiated by a group of potentially responsible parties known as the Lower Willamette Group (LWG) and completed by EPA in 2016 (EPA 2016a, 2016b). The RI consisted of three rounds of data collection, including surface and subsurface sediment, bank soils, surface water, sediment traps, porewater, fish tissue, and other media from 2001 through 2007.

This Field Sampling Plan (FSP) was prepared to support the surface sediment sampling efforts outlined in the PDI Work Plan (Geosyntec 2017) and the project Quality Assurance Project Plan (QAPP) (AECOM and Geosyntec 2018a). To the extent practicable, previously approved FSPs from the RI will be referenced.

## **1.1 Project Setting**

The PHSS is located in Portland, Oregon, on the lower Willamette River immediately downstream of the urban downtown area from river mile (RM) 1.9 upstream to 11.8 and covers 2,190 acres. There are two reaches located immediately upstream of the Site. The Downtown Reach, which includes the urbanized area of downtown Portland, is defined by EPA as extending from RM 11.8 to RM 16.6. EPA defines the Upriver Reach as extending from RM 16.6 to RM 28.4. Collectively, RM 11.8 to RM 28.4 is referred to as the D/U Reach.

## **1.2 Project Overview**

Two kinds of surface sediment data will be collected within the Site: 1) random stratified samples within a grid system (for establishing a new baseline dataset); and 2) targeted (non-random) samples located in SMA areas to support further refinement of the SMA footprints.

Additional surface sediment samples may be collected to reoccupy 2004 RI surface sediment locations. If this reoccupation of 2004 RI sampling activity was to occur, the same protocols would be followed outlined in this FSP and the description of the sampling activities would be developed as an addendum to this FSP and provided to EPA for consideration prior to sampling.

Surface sediment will be collected from a target depth of 0- to 30-centimeter depths, consistent with the RI (Integral 2004). A minimum depth of 10 centimeters will be considered acceptable (especially if sampling on a sediment cap). Additionally, surface sediment samples will be collected from the D/U Reach. The D/U Reach stations will be located in sediment areas targeting fine-grained sediment and higher total organic carbon (TOC), generally similar to surface sediment within the Site; target ranges are discussed in Section 2.1.4. The sampling scheme and RAOs are also discussed in the PDI Work Plan (Geosyntec 2017).

Baseline surface sediment samples will be analyzed for the ROD contaminants of concern (COCs). Surface sediment samples from targeted (non-random) stations will be analyzed for the focused COCs, which include dichlorodiphenyltrichloroethane and its derivatives (DDx), polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and dioxin/furans (D/F). All stations will be analyzed for grain size and TOC, and a portion of the fine-grained samples may be selected for Atterberg Limits geotechnical testing.

### 1.3 Data Quality Objectives

The stratified random surface sediment sampling effort, in conjunction with surface water and fish tissue data, will be used to update the current conditions for the full ROD suite of COCs (see ROD Table 17, relisted in Table 3 of the PDI Work Plan) and will provide a baseline for long-term monitoring and remedy effectiveness evaluations. As described in the PDI Work Plan (Geosyntec 2017), the SMA surface sediment sampling effort, along with baseline sampling, will help refine the CSM for the Site. Data quality objectives (DQOs) for surface sediment sampling are detailed in Table 3 of the project QAPP (AECOM and Geosyntec 2018a).

## 2. SAMPLING DESIGN AND APPROACH

This FSP has been prepared to ensure DQOs are met. Methods for surface sediment sampling are consistent with EPA-approved sampling plans from the RI (Integral Consulting [Integral] 2002, 2004, 2006), EPA guidance on collecting sediment data (EPA 2014), and Puget Sound Estuary Program (PSEP) protocols (PSEP 1996).

For clarification, terminology used in this FSP includes:

- Surface Sediment Sample = is a grab sample targeting the upper 30 cm of the sediment bed.

- Sample Location = is the sampling point shown on maps from which a chemistry sample was collected.
- Sample Station = is the place in space where the vessel is located to collect a sample or sub-station composite sample (a, b, and c stations).
- Upriver or Upstream Area = the spatial area located immediately upstream of the Site and includes the Downtown Reach and Upriver Reach.

## 2.1 Surface Sediment

Two kinds of surface sediment data will be collected within the Site: stratified random samples within a grid system to establish a baseline dataset and targeted (non-random) samples located in SMA areas to support further refinement of the SMA footprints. All surface sediment sampling stations within the Site are presented in Figure 2. In addition, upriver surface sediment data will be collected to evaluate current conditions and incoming contaminant loads. All surface sediment samples will consist of a three-point composite. At each proposed station, three “grabs” will be collected within a relatively small footprint and composited into one sample for analysis.

### 2.1.1 Stratified Random Sampling

A total of 428 sediment samples will be collected for this DQO. The gridded random stations will be applied throughout the Site, including areas where other parties are collecting post-RI data. All surface sediment sample types, numbers, and analyses are summarized in Table 1. Section 3.2.2 of the PDI Work Plan details the rationale and statistical justification for the stratified random sampling design. In summary, the total sample count reflects the number of samples required to improve upon the level of variability in the 2004 surface weighted average concentrations (SWAC) and to enable the design to statistically detect differences ( $\alpha = 0.05$ ) between 2004 SWACs and current SWAC estimates with an approximate 80percent level of statistical power. The dataset will be used to establish a baseline for future long-term monitoring. All stratified random surface stations will be analyzed for the full ROD Table 17 suite of COCs, plus grain size and TOC (see Section 5 for details).

Combined with the SMA samples (see below), this sample design represents the estimated 666 surface sediment sampling stations needed to yield a statistically robust new dataset for determining SWACs at varying scales.

### 2.1.2 Targeted SMA Delineation

A total of 178 targeted surface sediment sample stations will be collected to support further refinement of the SMA footprints. In addition, 60 surface grab samples will be co-located with the 60 deep in-water core stations in SMA areas. A total of 238 surface sediment grab samples will be collected for targeted SMA delineation. Details regarding the sediment core sampling are provided in the Subsurface Sediment Coring FSP (AECOM and Geosyntec 2018b).

The criteria considered for the placement of SMA surface sediment samples include:

- **Pairing with Core Collection in Deep Water Areas:** collect a co-located grab sample at each of the 60 proposed sediment core locations (rationale for core locations provided in the Subsurface Sediment Coring FSP)
- **Spatial Resolution:** Place adequate number of grab samples such that a sediment sample would be present approximately every 300 feet within the SMAs
- **Reduced Uncertainty for Future Planning:** The density of SMA sampling achieves the level of precision needed to delineate SMAs within an approximate 30 percent level of uncertainty, sufficient for the needs of the Pre-RD AOC Group to support SMA delineation need during remedial design.

#### 2.1.3 Downtown/Upriver Reaches

A total of 30 surface sediment samples will be collected from the Downtown Reach located immediately upstream of the Site, and 30 surface sediment samples will be collected from the Upriver Reach, for a total of 60 D/U Reach samples. All D/U locations will target fine-grained sediments with TOC concentrations similar to Site sediments to facilitate matching the D/U sediments with the Site sediments.

A review of previous sediment studies' available grain size data and bathymetry data was conducted to select initial target areas in the D/U Reach (RI/FS database; GSI Water Solutions, Inc. [GSI] and Hart Crowser 2010; GSI 2014; Kleinfelder 2015; Hart Crowser 2002). Samples were randomly placed in areas with more than 35 percent fines (sum of clay and silt fractions, defined as material passing through a #200 sieve for American Society for Testing and Materials [ASTM] grain size). The random placement process is comparable to the stratified random sampling design used within the Site as both used the same industry standard geospatial randomization algorithm for spatial coverage in GIS. However, where the stratified random samples within the Site were placed using a weighted grid (smaller cells near the banks, wider in the navigation channel), no grid was used for the D/U Reach samples as these are being randomized across areas with more than 35 percent fines. The randomization of each sampling location within a grid cell is comparable to the randomization of a sample location within the targeted area of more than 35 percent fines. Figure 3 presents the available percent fines data in the D/U Reach, and Figure 4 presents randomly placed proposed locations based on the initial desktop study. However, the actual collection locations will be selected based on confirmation of sufficient fine-grained sediment and TOC presence (see below).

#### 2.1.4 Pre-Screening D/U Sediments for Grain Size and TOC

It is critical that D/U Reach samples have grain size and TOC fractions similar to Site conditions, so they can be representative comparisons to the Site. In addition, cleanup levels for organic sediment COCs in the ROD are dry weight based values (i.e., not normalized for organic carbon content); therefore, TOC is required to be within the range of Site conditions for concentrations

of organic chemicals in D/U sediments to be evaluated within the context of cleanup levels for the Site. For reference, the average site-wide TOC is 1.8 percent (median of 1.7 percent) with a distribution range of 0.04 to 27 percent. The mean grain size distribution of site surface sediments is classified as a sandy silt. The average upriver TOC concentration is 1.1 percent with a range of 0.033 to 13 percent depending on the river reach. The TOC distribution in the Downtown Reach appears to be different from the upper reaches, especially from RM 22.7 to RM 28.4 where the sediment facies may be different. The historical data generally show good correlation between percent fines and TOC ( $r^2 = 0.90$ ), however neither percent fines alone or TOC alone are always well correlated with concentrations of organics. Based on an evaluation of paired upstream data, the correlation between percent fines and concentrations of total PCBs is low ( $r^2 = 0.18$ ), however the correlation between TOC and concentrations of total PCBs in sediment is significant ( $r^2 = 0.42$ ). Therefore, consideration of both parameters is required to ensure that the D/U Reach samples are appropriate for comparison to within Site data.

The process for determining D/U Reach sample locations based on grain size and TOC considerations is provided in Figure 5, and described below. In brief, the following steps will be performed:

- 1) Visual reconnaissance to map areas of fine grain sediments (>35 percent fines)
- 2) Placement of randomized sample locations within mapped areas of >35 percent fines.
- 3) Collection of surface sediment samples for full volume of sediment needed for analyses.
- 4) Expedited analysis of TOC and grain size
- 5) Decision criteria (target range) applied to each sample location, then either resample or analyze for full suite testing

As shown in Figure 5, geotechnical analyses may be performed based on grain size results; however, these do not impact the decision criteria. This process has been designed to result in a total of 60 D/U Reach surface sediment samples as presented in the PDI Work Plan with the highest likelihood of TOC and grain size that are appropriate for comparison to Site data. Each step is described in detail below.

**Visual Reconnaissance.** A field reconnaissance survey will be conducted prior to sampling to confirm a target area containing fine sediments. First, the sediment bottom will be probed using a steel-tipped rod to confirm the presence of fine-grained sediments in expected areas based on the desktop review of available grain size data. Best professional judgement can easily distinguish between predominantly coarse-grained material (sand and gravel) versus predominantly fine-grained material (silt and clay, and up to some sand). Second, an aliquot of mud will be collected (using the hydraulic power grab) and the sediment grain size fractions will be visually classified according to ASTM visual-manual soil classification methods for particle size (e.g., cobbles, rocks, silt, sand). The field staff will refer to the ASTM Unified Soil Classification System Log Key 2 (Appendix A-1). Visual inspections will include recording of the presence/absence of

organic matter, organic silt, leaf litter, roots, rootlets, and other organic matter that may indicate the presence of TOC.

**Mapping of Grain Size and Placement of Sample Locations.** Areas containing an estimated > 35 percent fines and presence of organic matter based on the visual reconnaissance will be mapped in GIS. There are 60 proposed locations shown in Figure 4; if any of the currently proposed locations fall outside of the areas of >35 percent fines determined by the visual reconnaissance, these locations will be re-located randomly within the areas of target percent fines.

**Sample Collection.:** Following the mapping of grain size and re-randomization of sample locations, it is anticipated that surface sediment sampling within the Site will still be on-going. At this point, the sampling vessel will return to the D/U Reach and all 60 D/U Reach sample locations will be sampled. Surface sediment samples will be collected, processed, and packaged (as described below) from all 60 D/U Reach sample locations.

**Expedited TOC and Grain Size Analysis.** The full sets of samples and jars collected will be submitted to the designated analytical lab. All analyses will be held, pending the result of a quick turnaround analysis of TOC by EPA Method 9060 and grain size by ASTM D7928 / D6913. Grain size analysis will include both the coarse- and fine fraction estimation of the sample (sieves and hydrometer), including determination of silts and clays.

- The target range for TOC is between 1 and 2.5 %
  - Analysis of available upstream data shows this range of TOC correlates with fines > 35 % and is consistent with the Site distribution of TOC (average of 1.8 %)
  - No samples will be analyzed with TOC < 0.5 %
- The target criteria for grain size is > 35 % fines with some clay present. No samples will be analyzed if < 35 % fines

**Review of Decision Criteria - Analysis of ROD Table 17 COCs or Resample.** Following expedited analysis of TOC and grain size, all samples meeting the criteria described above will be analyzed for the complete list of ROD Table 17 sediment COCs. Samples that do not meet the criteria for either TOC or grain size, will be relocated. To relocate samples, the results of expedited TOC and grain size will be mapped in GIS and areas that meet both target criteria will be identified. Sample locations requiring relocation will be randomly placed in the newly mapped areas, using the same industry standard randomization algorithm in GIS used previously (See Section 2.1.3), and sampled.

In the event that data indicate areas with target ranges of TOC and grain size in the D/U Reach are spatially limited, then multiple samples may be grouped in smaller areas and analysis of samples outside of the target range for TOC will be considered. However, no samples below the minimum requirements for TOC (0.5 percent) and grain size (< 35 percent) will be analyzed.

Once laboratory TOC and grain size fractions are confirmed to be within the targeted range, a subset of up to 10 samples with > 50 percent fines will be analyzed for Atterberg Limits testing to further classify fine-grained sediments. Methods for Atterberg Limits are noted in FSP Table 7 and in the project QAPP (AECOM and Geosyntec, 2018a).

## 2.2 Sample Identification

### 2.2.1 Sample Types, Locations, Depths

Consistent with the previous RI/FS protocol, surface sediment samples will be collected from 0 to 30 centimeters. Proposed surface sediment sample stations within the Site are provided in Figure 2 and in the D/U Reach in Figure 4. Sample location coordinates and sample identification numbers (IDs) are provided in Table 2. All surface grab samples will be collected as three-point composites with a hydraulic power grab sampler (see Section 4.3 below for more details).

Additionally, two alternative stations for the stratified random samples are provided in Figure 6 and Figure 7. Stations were re-randomized within each grid, using the same approach as the parent sample (see Section 4.4 below for more details on the rationale for selection of the two alternative stations).

### 2.2.2 Sample Nomenclature

Sample nomenclature will be developed in a manner similar to the RI Round 1 FSP (Integral 2002, Section 4.2). In brief, all samples will have a unique identifying sample ID that includes the following:

- Project phase (PDI).
- Sample matrix (SG [sediment grab]).
- Sample Area (B for baseline/stratified random samples and D/U Reach). All baseline sample stations will be numbered B001 through B428 and D/U Reach stations will be numbered B429 through B489 (N=60). All SMA or in-water core location stations will be numbered sequentially S001 through S238 (N=178 targeted SMA grab samples, N=60 in-water SMA core location samples). All surface sediment sample locations are numbered sequentially from downstream to upstream.
- Unique, sequential station number (001 to ### per sample area).
- Sampling round (BL1 [baseline monitoring round 1]).

For example, a surface grab sample from the 428th stratified random sampling location would have the sample ID PDI-SG-B428-BL1. See Section 4.2.1 of the QAPP for nomenclature associated with field duplicates and other quality assurance (QA)/quality control (QC) samples. Additional data fields that describe each unique sample features, location, composite type will be

recorded in the field forms and will be included in the project database, as described in the project Data Quality Management Plan (DQMP).

### 2.3 Sampling Schedule

The overall project schedule is outlined in the PDI Work Plan (Geosyntec 2017). Surface sediment grab sampling is targeted for First Quarter of 2018. EPA will be notified 1 to 2 weeks prior to sampling. Surface sediment sampling is expected to last 2 months using two sampling vessels. About 1 month into the program, progress will be assessed and, if it appears that the sampling effort is behind schedule, a third boat and crew will be mobilized to complete the sampling in the targeted 2-month period.

## 3. PROJECT ORGANIZATION/FIELD TEAM

### 3.1 Team Organization and Responsibilities

Team organization is detailed in the PDI Work Plan and in Section 2 of the QAPP (AECOM and Geosyntec 2018a). As it relates to this FSP, AECOM and Geosyntec are coordinating activities including management of all subcontractors, field sampling, analysis, and reporting scoping tasks. The PDI Project Coordinator, Mr. Ken Tyrrell, and PDI Project Manager, Dr. Jennifer Pretare, PhD (AECOM), will be responsible for overall project coordination and providing oversight on all project deliverables. Ms. Anne Fitzpatrick (Geosyntec) is the project's senior technical lead for this task. Ms. Nicky Moody (AECOM) and Mr. Keith Kroeger (Geosyntec) will be the Project Field Coordinators (FCs) and will be generally responsible for general field QA/QC oversight. The project chemists, Ms. Julia Klens-Caprio (Geosyntec), Ms. Amy Dahl (AECOM), and Ms. Karen Mixon (AECOM), will be responsible for coordination with labs regarding sample volumes, logistics, schedule, detection limits and matrix interferences, and ensuring overall data quality.

Gravity Marine (Gravity), of Fall City, Washington, will perform vessel support, with Shawn Hinz acting as a point of contact. Analytical laboratories include ALS Environmental (ALS) in Kelso, Washington, and TestAmerica Laboratories (TestAmerica) in Fife, Washington, Sacramento, California, and Knoxville, Tennessee.

### 3.2 Communication/Information Flow

The communication strategy is outlined in Section 2 of the QAPP (AECOM and Geosyntec 2018a). In brief, the Field Coordinators, Ms. Nicky Moody (AECOM) and Mr. Keith Kroeger (Geosyntec), will be the points of contact for field staff during the implementation of this FSP. Anne Fitzpatrick (Geosyntec) will be the senior technical lead for this task. Deviations from this FSP or the project-specific QAPP will be reported to Dr. Pretare, the PDI Project Manager, for

consultation. Significant deviations from the FSP/QAPP will be further reported to representatives of the Pre-RD AOC Group and EPA by the PDI Project Coordinator.

### 3.3 Coordination with EPA

The PDI Project Coordinator will notify the EPA Project Manager 1 to 2 weeks prior to beginning any field activities so that EPA can schedule any oversight activities required. The PDI Project Coordinator will also notify the EPA Project Manager once field activities have been completed.

Split samples for chemical analyses can be provided to EPA upon its request. EPA's Project Manager should contact the PDI Project Coordinator to coordinate this activity and determine appropriate logistics. If EPA elects to collect split samples, collection at stations where field duplicates are taken is recommended so that EPA's comparison samples can be evaluated relative to the field and analytical variability measured by the project team.

## 4. SAMPLE COLLECTION PROCEDURES

The following sections describe the procedures and methods that will be used during surface sediment sampling, including sampling procedures; recordkeeping; sample handling, storage and shipping; and field quality control procedures. All field sampling activities will follow procedures outlined in the project Health and Safety Plan (AECOM and Geosyntec 2018c).

### 4.1 Sampling Vessels and Equipment

Gravity will perform the surface sediment sampling activities. Gravity will utilize two sampling vessels, *RV Cayuse* and *RV Tieton*, equipped with hydraulic power grab samplers to complete the work. Both vessels have a virtual anchoring system that incorporates an autopilot and two small motors to keep the vessel on station without needing to set fixed anchors. The *RV Cayuse* is a 26-foot research vessel with landing craft design, crew cabin, and forward working area. The vessel has an A-frame with a custom research winch and dynamic positioning system. The *RV Tieton* is a 34-foot research vessel with landing craft design and crew cabin, pilot house, and forward working area. The vessel has an A-frame with custom research winch and dynamic positioning system. Supplemental vessels are available if additional or backup support for in-water sampling is needed. All vessels will be mobilized from Swan Island Launch.

Equipment and supplies will include all equipment for positioning, sampling, processing, recording, and shipping samples. Sample containers and preservatives, as well as coolers and packing material, will be supplied by the analytical laboratory. An equipment checklist is provided in Appendix A-2.

## 4.2 Station Positioning and Vertical Control

Station positioning and vertical control will be performed as detailed in the attached SOP (Appendix B-1). A differential global positioning system (DGPS) unit will be used to confirm the horizontal sampling locations to an accuracy of 1 to 2 meters. The DGPS accuracy will be confirmed each morning and evening at the PH-1 benchmark installed at the Swan Island boat launch for the project (see GPS station log in Appendix B-1). Confirmed station locations will be recorded to the nearest whole foot in North American Datum of 1983 National Adjustment of 2011, NAD83 (2011), State Plan Coordinate System (SPCS) Oregon North Zone, International Feet.

Vertical control will be established using an on-board fathometer or lead line to measure depth to mudline at sampling locations. The fathometer accuracy will be checked regularly by Gravity and calibrated when necessary following ASTM D6318 Standard Practice for Calibrating a Fathometer Using a Bar Check Method or other similar practice. Water depths will be converted to elevations in feet North American Vertical Datum of 1988 (NAVD88) based on synchronizing timestamped gauge data downloaded from the Northwest River Forecast Center for gauge PRT03, located near RM 12.8. As described in Appendix B-1, this river stage gauge data are reported in the Columbia River Datum (CRD), so a correction will be needed to convert to NAVD88. Water levels will be recorded to the nearest one tenth of a foot in the datum specified in the DQMP (AECOM and Geosyntec 2018d).

## 4.3 Sample Collection and Processing

In general, sample collection will be performed as described in the RI Round 1 FSP (Integral 2002), RI Round 2 FSP for Sediment Sampling and Benthic Toxicity Testing (Integral 2004), and the RI Round 3 FSP for Upstream and Downstream Sediment Sampling (Integral 2006) with modifications described herein.

Key changes from the RI Round 1 FSP include the following:

- Samples will be collected as three-point composite samples.
- Sediment will be collected from 0 to 30 centimeters (consistent with the Round 2 and Round 3 FSPs).
- Samples will be processed on the sampling vessel. Samples will be transported in coolers on ice to the field lab for sample packaging and shipment. The AECOM Sample Processing Facility at 1115 SE Caruthers Street, Portland, Oregon, is approximately 20 blocks from the Site and will be used as a base for staging work, core sample processing, sample storage, sample packaging and shipping, daily field team meetings, gear storage, decontamination, and other field support needs.

- The hydraulic power grab was designed and manufactured by Gravity Marine. The hydraulic power grab is 26 inches long, by 16 inches wide with a 14 inch grab depth. The approximate sampling volume is 0.3 cubic meters.

Standard Operating Procedures (SOPs) from the RI will be followed. The Surface Sediment Sampling SOP from Appendix F of the LWG FSP for RI Round 2 (Integral 2004), is provided in Appendix B-2, and consistent with Appendix D of the LWG FSP for RI Round 3 (Integral 2006), which was previously approved by EPA. These SOPs include lists of needed supplies and equipment, equipment decontamination, sediment sample collection, and sediment sample processing procedures. Procedures regarding the chain-of-custody, packaging, and shipping samples are presented in Section 4.3 of the project QAPP (AECOM and Geosyntec 2018a), and are consistent with those in the Surface Sediment Sampling SOP (Integral 2004)..

The hydraulic power grab samplers (similar to a van Veen grab sampler but with power-assist) will target collection of sediment from the upper 0 to 30 centimeters of sediment at three sampling points at each sample location (without adjusting vessel position); the three grab samples will be composited into a single sample for analysis. The three-point composite sample will be collected within a relatively small footprint around the sampling vessel (i.e., less than 25 feet). For example, grab #1 will be deployed, accepted, and processed on the deck of the vessel. The sampling vessel will then shift approximately 5 to 10 feet from the original sample location either using the vessel's engines or by pulling in 5 feet on one anchor while releasing 5 feet on the other anchor. This process will be repeated until there is an equal volume of sediment from the three grabs. Approximately 20 ounces (oz) (equal volume) of sediment will be collected from each of the three surface grabs. The sediment will be sampled using a stainless-steel spoon, then placed in a 20-oz jar or similar container, scoop or device (to estimate the equal volume), then transferred to a stainless-steel bowl for compositing. The spoon and container will be rinsed free of solids between subsample composite stations, but not decontaminated. Decontamination of the power grab and field equipment will take place between sample stations (as detailed in Section 4.7).

In general, the volume of sediment from the three-point surface grabs will be homogenized until uniform in color and texture. Color and texture will be described following the ASTM visual-soil classification method (Appendix A-1). Sediments will be collected from the hydraulic power grab using a stainless-steel spoon, avoiding sediments in contact with the sides of the power grab. Large organisms and pieces of debris will be removed and noted in the sample log sheet (Appendix A-3). Acceptance criteria include the following (PSEP 1996; Integral 2004):

1. No or minimal excess water leaking from the jaws of the sampler.
2. No excessive turbidity in the overlaying water of the sampler.
3. Sampler did not over-penetrate.
4. Sediment surface appears to be intact with minimal disturbance.

5. Program-specific penetration (target 30 centimeters) has been achieved (minimum of 20 centimeter).

After sample acceptance, the sediment will be placed in a large, stainless-steel bowl for homogenization. Once the volume of sediment from each grab has been homogenized to a uniform consistency and color, composited sediments will be visually described following ASTM visual-soil classification procedure in the field log book (Appendix A-1). Sediments will be placed in the appropriate laboratory-provided sampling containers and stored in a cooler at 4 degrees Celsius (°C) until transport to the laboratory.

#### 4.4 Contingency Plan for Field Condition Impediments to Collecting Samples

During the sediment grab sampling efforts, the field crew may encounter field conditions that preclude collection of grab samples at the planned stations (e.g., limited access, poor recovery, safety concerns, debris/rock/bedrock causing refusal). A total of three attempts will be made to relocate the sample to an area within a 25-foot radius of the planned station.<sup>1</sup> If an acceptable sample cannot be obtained within 25 feet, sample collection from within a 25-foot to 50-foot radius will be attempted.

For stratified random sample locations, if a sediment grab sample cannot be collected from within 50 feet of the target location due to inaccessibility or three failed grab attempts, the re-randomized Alternate Location 1 (Figure 6) will be attempted. If the Alternate Location 1 is inaccessible or three failed grab attempts occur, the re-randomized Alternate Location 2 (Figure 7) will be attempted. The field staff will notify the PDI Project Manager as soon as it is determined that a primary location and both alternatives cannot be sampled due to inaccessibility, and the EPA will be notified immediately by the PDI Project Coordinator. If three attempts at Alternative 2 locations fail to produce acceptable grab samples, then the three best sample attempts at this location will be retained for sample processing. The sampling depth will be recorded in the field notebooks. Sample location coordinates for Alternate 1 and Alternate 2 are provided in Tables 3 and 4, respectively. Alternate sampling locations were re-randomized using a GIS randomization program to maintain the geostatistical methods used during development of the PDI Work Plan (Geosyntec 2017). The rationale for moving to Alternate Location 1 or, if needed, Alternate Location 2, will be documented in the field log.

For SMA target locations, the radius protocol described above will be used. The re-randomization geostatistical methods are not necessary as a contingency plan for the SMA locations as these locations were not randomly generated. In the event that field conditions

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<sup>1</sup>Distances proposed in this FSP were based on previous sediment project experience in EPA Region 10.

preclude the field crews from collecting proposed target samples within SMAs, attempts from within a 25-foot to 50-foot radius will be continued until an acceptable grab is obtained.

#### **4.5 Sample Handling and Transport**

Chain-of-custody procedures will be followed as detailed in Section 4.3 of the project QAPP (AECOM and Geosyntec 2018a). These methods are consistent with the RI Round 1 FSP (Integral 2002) and similarly described in the RI Round 2 FSP and RI Round 3 FSP (Integral 2004 and 2006). Samples will be stored on ice at a temperature of 0 to 6°C in a field cooler and shipped to appropriate laboratories (See Section 4.3.4 Sample Packing and Shipping in project QAPP).

#### **4.6 Field Logbook and Forms**

All field activities will be recorded in a field logbook as outlined in Section 4.10.1 in the project QAPP (AECOM & Geosyntec, 2018d), consistent with Section 5.3 of the RI Round 1 FSP (Integral 2002). Field forms (Appendix A-3 of this FSP) will be completed as outlined in the project QAPP (AECOM & Geosyntec, 2018d), consistent with the RI Round 1 FSP (Integral 2002).

#### **4.7 Decontamination Procedures**

Equipment decontamination procedures will be performed as outlined in the RI Round 2 FSP Appendix F Sediment Sampling SOP (Integral 2004) provided in this FSP as Appendix B-2. This SOP is consistent with the RI Round 3 FSP Appendix D Sediment Sampling SOP (Integral 2006). Decontamination of field sampling equipment will occur between stations. For the 3-point composite sub-stations from which a composite sample will be generated, the grab sampler will be rinsed/sprayed with river water until all solid material is removed. Stainless steel sampling spoons will be rinsed with river water to remove residual solids between sub-stations and re-used among sub-sampling composite stations. Re-usable sampling equipment will be decontaminated between stations. In summary, the decontamination steps will include an initial rinse with vessel river water to dislodge particles, a scrub with brush and Alconox™ or other phosphate-free detergent, and then a rinse with deionized water. Additional rinses with nitric acid or methanol are not anticipated but may be considered based on sample conditions (e.g., excessive oily/tar residue). Sampling spoons and bowls will be covered with aluminum foil until use (dull side down).

#### **4.8 Investigation-Derived Waste Disposal**

Investigation-derived waste (IDW) disposal will occur as described in the Management of IDW SOP (Appendix B-3). In general, any excess water or sediment remaining after processing will be returned to the vicinity of the collection site. Any water or sediment spilled on the deck of the sampling vessel will be washed into the surface waters at the collection site before proceeding to

the next station. Phosphate-free detergent-bearing liquid wastes from decontamination of the sampling equipment will be washed overboard or disposed into the sanitary sewer system.

Tyvek, gloves, paper towels, plastic sheeting, and other waste material generated during sampling will be placed in heavyweight garbage bags or other appropriate containers and placed in normal refuse containers for disposal at a solid waste landfill.

#### 4.9 Field Quality Control

All QA/QC procedures are detailed in the QAPP (AECOM and Geosyntec 2018a). Requirements for QA/QC samples are provided in Table 5, and a summary of all field QA/QC sample numbers is provided in Table 6. In brief, homogenized field duplicates will be collected from the same composited bowl of homogenized sample on 5 percent of the samples to assess variability within samples. Other field QC samples, such as trip blanks, temperature blanks, and rinsate blanks, will be collected per sampling vessel (as needed) as outlined in Section 4.6.1 of the QAPP.

### 5. LABORATORY ANALYSIS

With the large numbers of samples and multiple analytes, it is best to separate the sample analyses among laboratories that specialize in certain analytical methods and have the capacity to complete the work on schedule. As such, the Pre-RD AOC Group has selected the following laboratories to perform the physical and chemical analyses:

- ALS in Kelso, Washington, will analyze for chlorinated pesticides, PAHs, bis-(2-ethylhexyl) phthalate, tributyltin, and total solids.
- TestAmerica in:
  - Fife, Washington, will analyze for total petroleum hydrocarbons diesel range, metals, TOC, grain size, and total solids.
  - Sacramento, California, will analyze for dioxins/furans.
  - Knoxville, Tennessee, will analyze for PCB congeners.

The analytes and analytical methods are provided in Table 7 for each sample type. Additional details on the analytical methods, QA/QC requirements and procedures, and laboratory-specific QA/QC requirements are detailed in Section 4.6 of the QAPP (AECOM and Geosyntec 2018a). All samples will be placed in laboratory-supplied sample containers and preserved according to analytical protocols. Sample containers, preservation requirements, holding times, and sample sizes are provided for all analyses in Table 8.

## **6. DATA MANAGEMENT AND REPORTING**

### **6.1 Field Data Management**

The procedures and activities outlined in this FSP are designed to ensure DQOs outlined in the PDI Work Plan are met. Specifically, and as detailed in Sections 4.2, 4.3, 4.6, and 4.10 in the QAPP (AECOM and Geosyntec 2018a), the following data management procedures will be performed in the field:

- All samples will be given a unique identifier (Section 2.2 of this FSP).
- All samples will be collected and transported under chain-of-custody control (Section 4.5 of this FSP).
- Field logbooks and data sheets will be maintained (Section 4.6 of this FSP).
- Field QA/QC samples will be collected according to the QAPP (Section 4.9 of this FSP).

### **6.2 Post-Analysis Data Management and Reporting**

Analytical laboratories will be required to adhere to all QA/QC procedures outlined in the QAPP. Laboratories will provide all data for field investigations in electronic format and QA/QC reports, including a narrative of the standard QA/QC protocols. Data validation and data management will be performed according to the QAPP and DQMP (AECOM and Geosyntec 2018d). Following data validation, all data, supplementary information, and validator qualifiers will be compiled into an SQL Server database for the project. Data summary files will be provided to EPA as they become available after data validation and database management.

Results from the implementation of this FSP will be used to support the data use objectives described in Section 1.3 of the PDI Work Plan (Geosyntec 2017: Table 5). Data summaries and evaluations will be included in the PDI Evaluation Report.

## **7. REFERENCES**

AECOM (AECOM Technical Services) and Geosyntec (Geosyntec Consultants, Inc.). 2018a. Draft Quality Assurance Project Plan Portland Harbor Pre-Remedial Design Investigation and Baseline Sampling. Portland Harbor Superfund Site. March.

AECOM and Geosyntec. 2018b. Subsurface Sediment Coring Field Sampling Plan Portland Harbor Pre-Remedial Design Investigation and Baseline Sampling. Portland Harbor Superfund Site, Portland Oregon. Prepared for the Pre-RD AOC Group for submittal to EPA Region 10, Seattle, WA. March.

AECOM and Geosyntec. 2018c. Health and Safety Plan Portland Harbor Pre-Remedial Design Investigation and Baseline Sampling. Portland Harbor Superfund Site. 13 March.

AECOM and Geosyntec. 2018d. Data Quality Management Plan Portland Harbor Pre-Remedial Design Investigation and Baseline Sampling. Portland Harbor Superfund Site. 22 February.

American Society of Testing and Materials (ASTM). ASTM D-2488-93. Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). pg. 225-235. ASTM D6318-03. 2014. Standard Practice for Calibrating a Fathometer Using a Bar Check Method, ASTM International, West Conshohocken, PA, 2014

EPA (United States Environmental Protection Agency). 2014. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Third Edition, Update V.

EPA. 2016a. Portland Harbor RI/FS, Final Remedial Investigation Report, Portland Oregon. United States Environmental Protection Agency Region 10, Seattle, Washington. 8 February.

EPA. 2016b. Portland Harbor RI/FS, Final Feasibility Study, Portland Oregon. United States Environmental Protection Agency Region 10, Seattle, Washington. June.

EPA. 2017a. Record of Decision Portland Harbor Superfund Site, Portland Oregon. United States Environmental Protection Agency Region 10, Seattle, Washington. January.

EPA. 2017b. ASAOC between US EPA and the Pre-RD AOC Group for Pre-Remedial Design Investigation Studies, Portland Harbor Superfund Site, Portland Oregon. United States Environmental Protection Agency Region 10, Seattle, Washington. 18 December.

Geosyntec (Geosyntec Consultants, Inc.). 2017. Final Work Plan, Portland Harbor Pre-Remedial Design Investigation Studies, Portland Harbor Superfund Site, Portland, Oregon. Prepared for the Pre-RD AOC Group for submittal to EPA Region 10. Attachment to the Statement of Work. 19 December.

GSI Water Solutions, Inc. (GSI), and Hart Crowser, Inc. 2010. Field and Data Report, Downtown Portland Sediment Characterization Phase II, Willamette River, Portland, Oregon. Prepared for Oregon Department of Environmental Quality. June.

GSI. 2014. Supplemental Remedial Investigation/Feasibility Study Field Sampling and Data Report, River Mile 11 East, Portland, Oregon. Prepared for RM11E Group. July.

Hart Crowser. 2002. Volume I Lower Willamette River Reference Area Study. Prepared for the U.S. Army Corps of Engineers. 9 April.

Integral (Integral Consulting). 2002. Round 1 Field Sampling Plan. Prepared for the Lower Willamette Group (LWG) for submittal and approval by EPA Region 10. 14 June.

Integral. 2004. Round 2 Round 2 Field Sampling Plan - Sediment Sampling and Benthic Toxicity Testing Prepared for the Lower Willamette Group (LWG) for submittal and approval by EPA Region 10. 21 June.

Integral. 2006. Preliminary Upstream & Downstream Sediment Data Evaluation and Round 3A Field Sampling Plan for Upstream & Downstream Sediment Sampling. Prepared for the Lower Willamette Group (LWG) for submittal and approval by EPA Region 10. 13 October.

Kleinfelder. 2015. Sediment Sampling Data Report, Portland Harbor, Portland, Oregon. Prepared for de maximis Inc. 1 June.

PSEP (Puget Sound Estuary Program). 1996. Puget Sound Estuary Program: Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound. Final Report. TC-3991-04. Prepared for U.S. Environmental Protection Agency, Region 10 and Puget Sound Estuary Program, Seattle, Washington. Tetra Tech and HRA, Inc., Bellevue, Washington.

## **TABLES**

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**Table 1. Summary of Surface Sediment Sample Types, Numbers, and Analytes**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Surface Sediment Sample Type	Number of Samples	Analyses
Stratified Random Site Samples	428	All ROD Table 17 Analytes
SMA Site Samples	178	Focused COCs
Co-located Grabs at In-water Core Stations	60	Focused COCs
Downtown Reach	30	All ROD Table 17 Analytes
Upriver Reach	30	All ROD Table 17 Analytes
<b>Total Count</b>	<b>726</b>	

**General Notes:**

1. All samples will be 0 to 30 cm depth.
2. All samples will be 3-point composites over a small footprint (< 25 ft).
3. Site = Portland Harbor Superfund Site RM 1.9 to 11.8
4. Downtown Reach = RM 11.8 to 16.6
5. Upriver Reach = RM 16.6 to 28.4

**Table 2. Station Location Coordinates, Target Depth and Identification Scheme**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B001-BL1	NA	7616223	726382	001
	PDI-SG-B002-BL1	-38.3	7616865	725994	002
	PDI-SG-B003-BL1	-41.6	7617552	725384	003
	PDI-SG-B004-BL1	-45.2	7617360	725438	004
	PDI-SG-B005-BL1	-49.0	7616987	725480	005
	PDI-SG-B006-BL1	-14.5	7616168	725962	006
	PDI-SG-B007-BL1	-45.1	7617274	725225	007
	PDI-SG-B008-BL1	-9.0	7616026	725856	008
	PDI-SG-B009-BL1	-45.6	7617115	724852	009
	PDI-SG-B010-BL1	-12.1	7615787	725287	010
	PDI-SG-B011-BL1	-30.3	7617513	724549	011
	PDI-SG-B012-BL1	-18.4	7615838	725048	012
	PDI-SG-B013-BL1	-49.0	7616429	724771	013
	PDI-SG-B014-BL1	-36.5	7617117	724302	014
	PDI-SG-B015-BL1	-43.9	7616457	724443	015
	PDI-SG-B016-BL1	NA	7615435	724765	016
	PDI-SG-B017-BL1	-36.9	7617158	724020	017
	PDI-SG-B018-BL1	-13.9	7615557	724533	018
	PDI-SG-B019-BL1	-33.2	7615583	723961	019
	PDI-SG-B020-BL1	-35.7	7616505	723723	020
	PDI-SG-B021-BL1	-34.2	7616599	723675	021
	PDI-SG-B022-BL1	-42.6	7615714	723434	022
	PDI-SG-B023-BL1	-34.4	7615581	723415	023
	PDI-SG-B024-BL1	-33.0	7616931	723304	024
	PDI-SG-B025-BL1	-46.2	7616151	723279	025
	PDI-SG-B026-BL1	-42.9	7615836	723147	026
	PDI-SG-B027-BL1	NA	7615152	723123	027
	PDI-SG-B028-BL1	-22.0	7616982	722941	028
	PDI-SG-B029-BL1	-3.9	7615256	722977	029
	PDI-SG-B030-BL1	-34.2	7616857	722699	030
	PDI-SG-B031-BL1	-32.1	7616836	722509	031
	PDI-SG-B032-BL1	-9.3	7615254	722326	032
	PDI-SG-B033-BL1	NA	7615163	721939	033
	PDI-SG-B034-BL1	-40.8	7616472	721953	034
	PDI-SG-B035-BL1	-54.7	7615532	721775	035
	PDI-SG-B036-BL1	-44.9	7616323	721720	036
	PDI-SG-B037-BL1	-43.6	7616122	721593	037
	PDI-SG-B038-BL1	-41.3	7616506	721652	038
	PDI-SG-B039-BL1	-45.0	7615969	721331	039
	PDI-SG-B040-BL1	-8.5	7615132	721046	040
	PDI-SG-B041-BL1	NA	7614939	720797	041
	PDI-SG-B042-BL1	NA	7616859	721056	042
	PDI-SG-B043-BL1	NA	7615002	720453	043
	PDI-SG-B044-BL1	-38.0	7616561	720789	044
	PDI-SG-B045-BL1	-44.0	7616117	720585	045
	PDI-SG-B046-BL1	-43.1	7616200	720559	046
	PDI-SG-B047-BL1	-41.9	7616580	720489	047
	PDI-SG-B048-BL1	-32.6	7613979	720275	048
	PDI-SG-B049-BL1	-7.8	7612801	720887	049
	PDI-SG-B050-BL1	-16.6	7615017	719963	050
	PDI-SG-B051-BL1	-41.3	7616668	720238	051
	PDI-SG-B052-BL1	-7.9	7614776	719726	052
	PDI-SG-B053-BL1	-11.1	7615032	719597	053
	PDI-SG-B054-BL1	NA	7616932	719955	054
	PDI-SG-B055-BL1	-16.9	7615493	719528	055
	PDI-SG-B056-BL1	-47.2	7616388	719570	056

**Table 2. Station Location Coordinates, Target Depth and Identification Scheme**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B057-BL1	NA	7615139	719198	057
	PDI-SG-B058-BL1	-45.5	7616134	719342	058
	PDI-SG-B059-BL1	-32.9	7616937	719319	059
	PDI-SG-B060-BL1	-25.6	7615665	718978	060
	PDI-SG-B061-BL1	-43.4	7616694	718944	061
	PDI-SG-B062-BL1	-6.1	7617080	719063	062
	PDI-SG-B063-BL1	-40.0	7616930	718861	063
	PDI-SG-B064-BL1	-34.6	7615895	718389	064
	PDI-SG-B065-BL1	-30.9	7615779	718210	065
	PDI-SG-B066-BL1	-43.7	7616398	718313	066
	PDI-SG-B067-BL1	-22.5	7617278	718377	067
	PDI-SG-B068-BL1	-42.1	7617183	718225	068
	PDI-SG-B069-BL1	-46.1	7616565	718055	069
	PDI-SG-B070-BL1	-36.6	7616117	717965	070
	PDI-SG-B071-BL1	-36.4	7616265	717583	071
	PDI-SG-B072-BL1	-44.4	7617290	717850	072
	PDI-SG-B073-BL1	-51.9	7617416	717666	073
	PDI-SG-B074-BL1	-33.4	7616310	717241	074
	PDI-SG-B075-BL1	-45.7	7617627	717363	075
	PDI-SG-B076-BL1	-49.7	7617698	717198	076
	PDI-SG-B077-BL1	-38.0	7618030	717200	077
	PDI-SG-B078-BL1	-10.9	7619956	717203	078
	PDI-SG-B079-BL1	-45.1	7616746	716853	079
	PDI-SG-B080-BL1	-35.1	7616547	716760	080
	PDI-SG-B081-BL1	-30.7	7616513	716599	081
	PDI-SG-B082-BL1	-31.6	7617869	716776	082
	PDI-SG-B083-BL1	-26.6	7616599	716189	083
	PDI-SG-B084-BL1	NA	7618120	716555	084
	PDI-SG-B085-BL1	-44.4	7617364	716252	085
	PDI-SG-B086-BL1	-51.8	7617651	716168	086
	PDI-SG-B087-BL1	-26.6	7618103	716297	087
	PDI-SG-B088-BL1	-17.7	7616828	715518	088
	PDI-SG-B089-BL1	-34.8	7618148	716034	089
	PDI-SG-B090-BL1	NA	7616826	715201	090
	PDI-SG-B091-BL1	-21.5	7616981	715113	091
	PDI-SG-B092-BL1	-40.9	7617312	715070	092
	PDI-SG-B093-BL1	-43.4	7617600	715093	093
	PDI-SG-B094-BL1	-16.6	7618474	715577	094
	PDI-SG-B095-BL1	-59.1	7618290	715307	095
	PDI-SG-B096-BL1	NA	7617115	714676	096
	PDI-SG-B097-BL1	NA	7618610	715242	097
	PDI-SG-B098-BL1	NA	7617185	714478	098
	PDI-SG-B099-BL1	-26.6	7618646	715118	099
	PDI-SG-B100-BL1	-34.8	7618892	714586	100
	PDI-SG-B101-BL1	-22.0	7619525	714384	101
	PDI-SG-B102-BL1	-34.8	7620153	714455	102
	PDI-SG-B103-BL1	NA	7617357	713841	103
	PDI-SG-B104-BL1	NA	7617560	713699	104
	PDI-SG-B105-BL1	-18.0	7619021	714287	105
	PDI-SG-B106-BL1	-24.2	7617800	713484	106
	PDI-SG-B107-BL1	-24.4	7619107	714002	107
	PDI-SG-B108-BL1	-70.9	7618632	713521	108
	PDI-SG-B109-BL1	-13.1	7619349	713804	109
	PDI-SG-B110-BL1	NA	7617843	713024	110
	PDI-SG-B111-BL1	-51.4	7618289	713159	111
	PDI-SG-B112-BL1	-8.6	7618138	712695	112
	PDI-SG-B113-BL1	-59.7	7618634	712845	113

**Table 2. Station Location Coordinates, Target Depth and Identification Scheme**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B114-BL1	-46.7	7619531	713352	114
	PDI-SG-B115-BL1	NA	7618159	712484	115
	PDI-SG-B116-BL1	-38.2	7619707	713147	116
	PDI-SG-B117-BL1	-40.1	7619969	713213	117
	PDI-SG-B118-BL1	-66.7	7619241	712696	118
	PDI-SG-B119-BL1	-6.8	7618367	712152	119
	PDI-SG-B120-BL1	-14.0	7619712	712826	120
	PDI-SG-B121-BL1	-30.6	7619809	712521	121
	PDI-SG-B122-BL1	NA	7618475	711792	122
	PDI-SG-B123-BL1	-47.0	7618979	711926	123
	PDI-SG-B124-BL1	-65.8	7619575	712072	124
	PDI-SG-B125-BL1	-39.8	7619944	712113	125
	PDI-SG-B126-BL1	-31.9	7618818	711480	126
	PDI-SG-B127-BL1	-40.3	7620085	711863	127
	PDI-SG-B128-BL1	-13.8	7618964	711098	128
	PDI-SG-B129-BL1	-19.5	7619124	710850	129
	PDI-SG-B130-BL1	-22.6	7620378	711474	130
	PDI-SG-B131-BL1	-27.5	7620401	711377	131
	PDI-SG-B132-BL1	-77.4	7619946	711038	132
	PDI-SG-B133-BL1	-35.5	7619335	710638	133
	PDI-SG-B134-BL1	-31.6	7620573	710980	134
	PDI-SG-B135-BL1	NA	7619508	710115	135
	PDI-SG-B136-BL1	-40.5	7619758	710194	136
	PDI-SG-B137-BL1	NA	7619635	709986	137
	PDI-SG-B138-BL1	NA	7620817	710617	138
	PDI-SG-B139-BL1	-19.6	7619912	709809	139
	PDI-SG-B140-BL1	-45.2	7620050	709917	140
	PDI-SG-B141-BL1	-11.1	7621028	710377	141
	PDI-SG-B142-BL1	-31.1	7621075	710135	142
	PDI-SG-B143-BL1	-53.1	7620965	709796	143
	PDI-SG-B144-BL1	-8.4	7620205	709319	144
	PDI-SG-B145-BL1	-22.5	7621328	709783	145
	PDI-SG-B146-BL1	-46.2	7620660	709266	146
	PDI-SG-B147-BL1	-31.9	7620494	709050	147
	PDI-SG-B148-BL1	NA	7621459	709649	148
	PDI-SG-B149-BL1	-32.9	7620583	708939	149
	PDI-SG-B150-BL1	-54.6	7621237	709164	150
	PDI-SG-B151-BL1	-16.8	7621572	709342	151
	PDI-SG-B152-BL1	-21.9	7620874	708595	152
	PDI-SG-B153-BL1	-17.4	7621085	708293	153
	PDI-SG-B154-BL1	-32.5	7621846	708885	154
	PDI-SG-B155-BL1	-16.0	7622091	708750	155
	PDI-SG-B156-BL1	-45.7	7621918	708531	156
	PDI-SG-B157-BL1	NA	7621324	707900	157
	PDI-SG-B158-BL1	-34.3	7621554	707828	158
	PDI-SG-B159-BL1	NA	7622233	708556	159
	PDI-SG-B160-BL1	-25.9	7621686	707653	160
	PDI-SG-B161-BL1	NA	7621756	707507	161
	PDI-SG-B162-BL1	-43.7	7622420	708161	162
	PDI-SG-B163-BL1	-37.8	7622493	708153	163
	PDI-SG-B164-BL1	-52.8	7622683	707805	164
	PDI-SG-B165-BL1	NA	7622000	707091	165
	PDI-SG-B166-BL1	-13.0	7622217	706965	166
	PDI-SG-B167-BL1	-10.5	7623016	707770	167
	PDI-SG-B168-BL1	-45.8	7622578	707128	168
	PDI-SG-B169-BL1	-46.9	7623053	707443	169
	PDI-SG-B170-BL1	-16.9	7622551	706680	170

**Table 2. Station Location Coordinates, Target Depth and Identification Scheme**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B171-BL1	-47.3	7623258	707067	171
	PDI-SG-B172-BL1	-5.0	7622702	706401	172
	PDI-SG-B173-BL1	-53.0	7623400	706796	173
	PDI-SG-B174-BL1	-10.1	7622912	706126	174
	PDI-SG-B175-BL1	-47.6	7623548	706865	175
	PDI-SG-B176-BL1	-57.1	7623277	706482	176
	PDI-SG-B177-BL1	-51.5	7623623	706712	177
	PDI-SG-B178-BL1	-38.3	7623543	706020	178
	PDI-SG-B179-BL1	NA	7623610	705858	179
	PDI-SG-B180-BL1	-42.8	7624151	706660	180
	PDI-SG-B181-BL1	-44.7	7623768	705961	181
	PDI-SG-B182-BL1	NA	7623843	705709	182
	PDI-SG-B183-BL1	-48.8	7624178	706187	183
	PDI-SG-B184-BL1	-25.3	7624403	706537	184
	PDI-SG-B185-BL1	-19.2	7624738	706488	185
	PDI-SG-B186-BL1	NA	7624283	705458	186
	PDI-SG-B187-BL1	-38.0	7624407	705530	187
	PDI-SG-B188-BL1	-51.4	7624609	705861	188
	PDI-SG-B189-BL1	NA	7624492	705341	189
	PDI-SG-B190-BL1	-43.1	7624954	706047	190
	PDI-SG-B191-BL1	-43.7	7625178	705894	191
	PDI-SG-B192-BL1	NA	7625008	704995	192
	PDI-SG-B193-BL1	NA	7625099	704992	193
	PDI-SG-B194-BL1	-42.6	7625455	705395	194
	PDI-SG-B195-BL1	-49.6	7625602	705583	195
	PDI-SG-B196-BL1	-41.4	7625369	704990	196
	PDI-SG-B197-BL1	-50.4	7626034	705608	197
	PDI-SG-B198-BL1	-33.0	7625624	704770	198
	PDI-SG-B199-BL1	-16.4	7625705	704679	199
	PDI-SG-B200-BL1	-25.3	7626544	705786	200
	PDI-SG-B201-BL1	-28.9	7626061	704510	201
	PDI-SG-B202-BL1	-44.7	7626480	704945	202
	PDI-SG-B203-BL1	-28.0	7626718	705358	203
	PDI-SG-B204-BL1	-22.1	7626955	705370	204
	PDI-SG-B205-BL1	-34.6	7626347	704356	205
	PDI-SG-B206-BL1	-45.2	7626570	704436	206
	PDI-SG-B207-BL1	NA	7626403	703870	207
	PDI-SG-B208-BL1	-20.7	7627365	704793	208
	PDI-SG-B209-BL1	NA	7626510	703675	209
	PDI-SG-B210-BL1	-43.8	7627321	704274	210
	PDI-SG-B211-BL1	-47.4	7627454	704204	211
	PDI-SG-B212-BL1	-39.7	7627079	703734	212
	PDI-SG-B213-BL1	NA	7626878	703454	213
	PDI-SG-B214-BL1	NA	7628162	704529	214
	PDI-SG-B215-BL1	-25.7	7628014	704229	215
	PDI-SG-B216-BL1	NA	7627106	703159	216
	PDI-SG-B217-BL1	NA	7628505	704240	217
	PDI-SG-B218-BL1	-16.6	7627563	702927	218
	PDI-SG-B219-BL1	NA	7627584	702769	219
	PDI-SG-B220-BL1	-46.4	7628122	703075	220
	PDI-SG-B221-BL1	-60.2	7628432	703284	221
	PDI-SG-B222-BL1	-35.8	7628152	702596	222
	PDI-SG-B223-BL1	NA	7628032	702321	223
	PDI-SG-B224-BL1	-57.1	7628824	703173	224
	PDI-SG-B225-BL1	-13.4	7628174	702214	225
	PDI-SG-B226-BL1	-9.2	7629476	703298	226
	PDI-SG-B227-BL1	-42.5	7628726	702265	227
	PDI-SG-B228-BL1	-49.3	7628994	702411	228

**Table 2. Station Location Coordinates, Target Depth and Identification Scheme**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B229-BL1	-54.5	7629186	702585	229
	PDI-SG-B230-BL1	-25.5	7628536	701853	230
	PDI-SG-B231-BL1	-51.6	7629323	702392	231
	PDI-SG-B232-BL1	NA	7628614	701604	232
	PDI-SG-B233-BL1	-18.0	7630137	702514	233
	PDI-SG-B234-BL1	-44.0	7629711	702151	234
	PDI-SG-B235-BL1	-41.1	7629189	701648	235
	PDI-SG-B236-BL1	-19.7	7628694	701204	236
	PDI-SG-B237-BL1	-26.9	7628589	700934	237
	PDI-SG-B238-BL1	-16.3	7630464	702247	238
	PDI-SG-B239-BL1	-35.8	7628723	700679	239
	PDI-SG-B240-BL1	-10.4	7630610	702121	240
	PDI-SG-B241-BL1	-20.3	7629090	700309	241
	PDI-SG-B242-BL1	-52.8	7630100	701206	242
	PDI-SG-B243-BL1	-20.0	7631008	701861	243
	PDI-SG-B244-BL1	NA	7631240	701810	244
	PDI-SG-B245-BL1	-9.2	7629632	700257	245
	PDI-SG-B246-BL1	-10.9	7629848	700119	246
	PDI-SG-B247-BL1	-36.2	7631400	701516	247
	PDI-SG-B248-BL1	-20.3	7631597	701592	248
	PDI-SG-B249-BL1	NA	7631939	701629	249
	PDI-SG-B250-BL1	-40.4	7630574	700344	250
	PDI-SG-B251-BL1	NA	7630148	699860	251
	PDI-SG-B252-BL1	-29.6	7632256	701598	252
	PDI-SG-B253-BL1	NA	7630330	699532	253
	PDI-SG-B254-BL1	-23.5	7632677	701777	254
	PDI-SG-B255-BL1	-32.6	7632109	701132	255
	PDI-SG-B256-BL1	-44.0	7631135	699980	256
	PDI-SG-B257-BL1	-13.7	7630632	699464	257
	PDI-SG-B258-BL1	-42.8	7631704	700269	258
	PDI-SG-B259-BL1	-32.8	7632116	700590	259
	PDI-SG-B260-BL1	-49.6	7632675	701227	260
	PDI-SG-B261-BL1	NA	7631938	700224	261
	PDI-SG-B262-BL1	-16.1	7630768	699211	262
	PDI-SG-B263-BL1	-27.9	7633388	701785	263
	PDI-SG-B264-BL1	-58.5	7632140	700244	264
	PDI-SG-B265-BL1	-29.6	7633513	701483	265
	PDI-SG-B266-BL1	-33.5	7632235	699964	266
	PDI-SG-B267-BL1	-31.5	7631463	699206	267
	PDI-SG-B268-BL1	-9.5	7631196	698783	268
	PDI-SG-B269-BL1	-11.1	7631292	698677	269
	PDI-SG-B270-BL1	-48.7	7632207	699406	270
	PDI-SG-B271-BL1	-34.0	7633484	701223	271
	PDI-SG-B272-BL1	-37.5	7632535	699645	272
	PDI-SG-B273-BL1	-33.1	7633887	701103	273
	PDI-SG-B274-BL1	-36.1	7632665	699558	274
	PDI-SG-B275-BL1	-12.2	7631501	698100	275
	PDI-SG-B276-BL1	-45.4	7632542	698917	276
	PDI-SG-B277-BL1	-13.5	7631722	697935	277
	PDI-SG-B278-BL1	-40.4	7632981	699260	278
	PDI-SG-B279-BL1	-23.7	7634346	700967	279
	PDI-SG-B280-BL1	-32.2	7634458	700657	280
	PDI-SG-B281-BL1	-38.0	7633219	699056	281
	PDI-SG-B282-BL1	-25.0	7632337	698186	282
	PDI-SG-B283-BL1	NA	7631774	697610	283
	PDI-SG-B284-BL1	NA	7634868	700603	284
	PDI-SG-B285-BL1	-41.9	7633352	698900	285
	PDI-SG-B286-BL1	-6.6	7632185	697491	286

**Table 2. Station Location Coordinates, Target Depth and Identification Scheme**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B287-BL1	-38.7	7633089	698217	287
	PDI-SG-B288-BL1	-29.9	7634887	700392	288
	PDI-SG-B289-BL1	-38.0	7633722	698591	289
	PDI-SG-B290-BL1	NA	7632621	697143	290
	PDI-SG-B291-BL1	-14.7	7632907	697095	291
	PDI-SG-B292-BL1	-34.0	7633442	697663	292
	PDI-SG-B293-BL1	NA	7634072	698575	293
	PDI-SG-B294-BL1	-23.5	7635412	700151	294
	PDI-SG-B295-BL1	-37.5	7633711	697721	295
	PDI-SG-B296-BL1	-25.9	7635402	699676	296
	PDI-SG-B297-BL1	-13.1	7634411	698221	297
	PDI-SG-B298-BL1	NA	7633314	696787	298
	PDI-SG-B299-BL1	-28.0	7633527	696813	299
	PDI-SG-B300-BL1	-29.4	7633846	697210	300
	PDI-SG-B301-BL1	NA	7634572	698170	301
	PDI-SG-B302-BL1	-20.3	7635524	699491	302
	PDI-SG-B303-BL1	-23.2	7635971	699580	303
	PDI-SG-B304-BL1	-33.1	7634678	697884	304
	PDI-SG-B305-BL1	NA	7633798	696564	305
	PDI-SG-B306-BL1	-32.3	7634433	696984	306
	PDI-SG-B307-BL1	NA	7635056	697778	307
	PDI-SG-B308-BL1	-21.1	7636178	699081	308
	PDI-SG-B309-BL1	-10.6	7634355	696256	309
	PDI-SG-B310-BL1	-14.9	7634402	696241	310
	PDI-SG-B311-BL1	-45.1	7634995	697138	311
	PDI-SG-B312-BL1	-33.6	7635199	697487	312
	PDI-SG-B313-BL1	-14.3	7636417	698725	313
	PDI-SG-B314-BL1	-3.9	7635609	697319	314
	PDI-SG-B315-BL1	-6.9	7636897	698745	315
	PDI-SG-B316-BL1	-25.1	7634928	695974	316
	PDI-SG-B317-BL1	-21.9	7635041	695874	317
	PDI-SG-B318-BL1	-45.3	7635739	696577	318
	PDI-SG-B319-BL1	-25.1	7635989	696999	319
	PDI-SG-B320-BL1	-22.5	7636122	696932	320
	PDI-SG-B321-BL1	-16.0	7635543	695787	321
	PDI-SG-B322-BL1	-16.8	7635680	695666	322
	PDI-SG-B323-BL1	-42.0	7636084	696134	323
	PDI-SG-B324-BL1	-25.4	7636625	696614	324
	PDI-SG-B325-BL1	-20.1	7635992	695430	325
	PDI-SG-B326-BL1	-14.1	7636724	696564	326
	PDI-SG-B327-BL1	-21.8	7636483	695369	327
	PDI-SG-B328-BL1	-32.3	7637014	696259	328
	PDI-SG-B329-BL1	-36.4	7636814	695564	329
	PDI-SG-B330-BL1	-74.0	7637158	695822	330
	PDI-SG-B331-BL1	-24.1	7637380	696139	331
	PDI-SG-B332-BL1	NA	7636670	694831	332
	PDI-SG-B333-BL1	NA	7636891	694755	333
	PDI-SG-B334-BL1	-41.2	7637422	695253	334
	PDI-SG-B335-BL1	-13.7	7637827	695913	335
	PDI-SG-B336-BL1	-34.3	7637847	695786	336
	PDI-SG-B337-BL1	-3.6	7637295	694326	337
	PDI-SG-B338-BL1	-13.8	7637443	694285	338
	PDI-SG-B339-BL1	NA	7638211	695705	339
	PDI-SG-B340-BL1	-39.9	7638287	695470	340
	PDI-SG-B341-BL1	NA	7638545	695546	341
	PDI-SG-B342-BL1	-32.5	7638030	694371	342
	PDI-SG-B343-BL1	-51.2	7638527	695195	343
	PDI-SG-B344-BL1	-30.4	7638152	694220	344

**Table 2. Station Location Coordinates, Target Depth and Identification Scheme**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B345-BL1	-30.2	7638665	695328	345
	PDI-SG-B346-BL1	-37.8	7638388	694508	346
	PDI-SG-B347-BL1	-4.2	7639021	695279	347
	PDI-SG-B348-BL1	-36.3	7638526	693899	348
	PDI-SG-B349-BL1	-37.2	7638615	693813	349
	PDI-SG-B350-BL1	-35.6	7639298	694908	350
	PDI-SG-B351-BL1	-18.3	7639611	694986	351
	PDI-SG-B352-BL1	-40.5	7639033	693807	352
	PDI-SG-B353-BL1	-36.5	7639871	694437	353
	PDI-SG-B354-BL1	-37.9	7639013	693466	354
	PDI-SG-B355-BL1	-21.5	7640151	694091	355
	PDI-SG-B356-BL1	-38.7	7639217	693269	356
	PDI-SG-B357-BL1	-41.3	7639356	693362	357
	PDI-SG-B358-BL1	-38.9	7639255	693228	358
	PDI-SG-B359-BL1	-37.9	7640160	693929	359
	PDI-SG-B360-BL1	-40.6	7640157	693685	360
	PDI-SG-B361-BL1	-34.6	7640370	693631	361
	PDI-SG-B362-BL1	-24.6	7639602	692854	362
	PDI-SG-B363-BL1	-22.1	7639731	692681	363
	PDI-SG-B364-BL1	-31.9	7640564	693260	364
	PDI-SG-B365-BL1	-34.3	7640672	693077	365
	PDI-SG-B366-BL1	-49.7	7640270	692769	366
	PDI-SG-B367-BL1	-27.5	7640048	692298	367
	PDI-SG-B368-BL1	-29.3	7640165	692146	368
	PDI-SG-B369-BL1	-34.5	7640977	692683	369
	PDI-SG-B370-BL1	-50.2	7640836	692188	370
	PDI-SG-B371-BL1	-22.1	7640433	691791	371
	PDI-SG-B372-BL1	-9.9	7641258	692381	372
	PDI-SG-B373-BL1	-9.6	7641436	692177	373
	PDI-SG-B374-BL1	-25.3	7640657	691549	374
	PDI-SG-B375-BL1	-37.8	7641487	691912	375
	PDI-SG-B376-BL1	-29.2	7641571	691924	376
	PDI-SG-B377-BL1	-27.9	7640953	691149	377
	PDI-SG-B378-BL1	-52.0	7641333	691382	378
	PDI-SG-B379-BL1	-25.2	7641874	691570	379
	PDI-SG-B380-BL1	NA	7640838	690487	380
	PDI-SG-B381-BL1	NA	7642057	691442	381
	PDI-SG-B382-BL1	NA	7641283	690634	382
	PDI-SG-B383-BL1	-11.5	7641555	690395	383
	PDI-SG-B384-BL1	-55.8	7641949	690485	384
	PDI-SG-B385-BL1	-6.0	7642430	690949	385
	PDI-SG-B386-BL1	-14.0	7642539	690766	386
	PDI-SG-B387-BL1	NA	7641767	690106	387

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Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B388-BL1	-43.4	7642465	690598	388
	PDI-SG-B389-BL1	-21.3	7642739	690508	389
	PDI-SG-B390-BL1	-9.8	7642022	689886	390
	PDI-SG-B391-BL1	-49.8	7642656	690280	391
	PDI-SG-B392-BL1	NA	7642895	690405	392
	PDI-SG-B393-BL1	-17.6	7642418	689508	393
	PDI-SG-B394-BL1	-34.0	7642543	689635	394
	PDI-SG-B395-BL1	-16.2	7642652	689308	395
	PDI-SG-B396-BL1	-15.1	7643325	689968	396
	PDI-SG-B397-BL1	-9.2	7642904	689061	397
	PDI-SG-B398-BL1	-24.2	7643596	689772	398
	PDI-SG-B399-BL1	-45.2	7643535	689456	399
	PDI-SG-B400-BL1	-31.3	7643852	689582	400
	PDI-SG-B401-BL1	-29.8	7643266	688913	401
	PDI-SG-B402-BL1	NA	7643133	688763	402
	PDI-SG-B403-BL1	NA	7643183	688734	403
	PDI-SG-B404-BL1	-41.8	7643915	689458	404
	PDI-SG-B405-BL1	-10.6	7644261	689277	405
	PDI-SG-B406-BL1	NA	7643497	688411	406
	PDI-SG-B407-BL1	-11.2	7643740	688216	407
	PDI-SG-B408-BL1	-49.2	7644499	688962	408
	PDI-SG-B409-BL1	-48.4	7644402	688802	409
	PDI-SG-B410-BL1	-44.7	7644669	688722	410
	PDI-SG-B411-BL1	NA	7644006	687988	411
	PDI-SG-B412-BL1	-32.6	7644268	687874	412
	PDI-SG-B413-BL1	NA	7644285	687670	413
	PDI-SG-B414-BL1	-24.1	7644917	688372	414
	PDI-SG-B415-BL1	-32.7	7645019	688145	415
	PDI-SG-B416-BL1	-37.0	7644534	687614	416
	PDI-SG-B417-BL1	-38.1	7644567	687621	417
	PDI-SG-B418-BL1	-39.1	7645168	687847	418
	PDI-SG-B419-BL1	-41.2	7644909	687601	419
	PDI-SG-B420-BL1	-40.1	7644993	687639	420
	PDI-SG-B421-BL1	-49.2	7644975	687415	421
	PDI-SG-B422-BL1	-41.7	7645169	687531	422
	PDI-SG-B423-BL1	-45.2	7645386	687495	423
	PDI-SG-B424-BL1	-50.4	7645151	687009	424
	PDI-SG-B425-BL1	-26.8	7645237	686724	425
	PDI-SG-B426-BL1	-36.8	7645725	687007	426
	PDI-SG-B427-BL1	-67.0	7645741	686809	427
	PDI-SG-B428-BL1	-68.1	7645737	686591	428

**Table 2. Station Location Coordinates, Target Depth and Identification Scheme**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Downtown/ Upriver Reach <sup>c</sup>	PDI-SG-B429	-73.4	7646059	686518	429
	PDI-SG-B430	-36.6	7646079	685515	430
	PDI-SG-B431	-5.9	7646978	685751	431
	PDI-SG-B432	-63.6	7646725	684476	432
	PDI-SG-B433	-7.5	7646388	681672	433
	PDI-SG-B434	-23.9	7645980	679884	434
	PDI-SG-B435	NA	7645539	678745	435
	PDI-SG-B436	-35.9	7645990	678995	436
	PDI-SG-B437	-24.2	7646509	679295	437
	PDI-SG-B438	-39.4	7646589	678770	438
	PDI-SG-B439	-19.6	7646095	677944	439
	PDI-SG-B440	-43.7	7646620	677295	440
	PDI-SG-B441	NA	7647787	675183	441
	PDI-SG-B442	-41.1	7646819	674434	442
	PDI-SG-B443	-17.2	7646243	673938	443
	PDI-SG-B444	NA	7648127	673241	444
	PDI-SG-B445	NA	7645481	672286	445
	PDI-SG-B446	NA	7647373	670102	446
	PDI-SG-B447	-25.7	7645449	670039	447
	PDI-SG-B448	NA	7649494	669537	448
	PDI-SG-B449	-42.1	7645962	669233	449
	PDI-SG-B450	-25.5	7646998	668787	450
	PDI-SG-B451	NA	7648657	668013	451
	PDI-SG-B452	NA	7648026	667765	452
	PDI-SG-B453	-36.0	7646208	667787	453
	PDI-SG-B454	NA	7647456	666820	454
	PDI-SG-B455	-48.9	7646659	666343	455
	PDI-SG-B456	-9.6	7646061	665424	456
	PDI-SG-B457	-29.1	7646377	664928	457
	PDI-SG-B458	-23.4	7646473	662733	458
	PDI-SG-B459	NA	7646575	661675	459
	PDI-SG-B460	NA	7648175	659065	460
	PDI-SG-B461	NA	7648443	657701	461
	PDI-SG-B462	NA	7649075	656518	462
	PDI-SG-B463	NA	7650905	654820	463
	PDI-SG-B464	NA	7651215	652869	464
	PDI-SG-B465	NA	7650227	653028	465
	PDI-SG-B466	NA	7650034	649838	466
	PDI-SG-B467	NA	7649116	648455	467
	PDI-SG-B468	NA	7648574	645660	468
	PDI-SG-B469	NA	7650556	641257	469
	PDI-SG-B470	NA	7651435	639491	470
	PDI-SG-B471	NA	7655225	637368	471
	PDI-SG-B472	NA	7655665	634751	472
	PDI-SG-B473	NA	7656624	634180	473
	PDI-SG-B474	NA	7657130	632146	474
	PDI-SG-B475	NA	7657960	630087	475
	PDI-SG-B476	NA	7658613	629829	476
	PDI-SG-B477	NA	7659340	628418	477
	PDI-SG-B478	NA	7660512	628729	478
	PDI-SG-B479	NA	7661422	627565	479
	PDI-SG-B480	NA	7661789	626423	480
	PDI-SG-B481	NA	7660848	625203	481
	PDI-SG-B482	NA	7656520	620746	482
	PDI-SG-B483	NA	7655444	619932	483
	PDI-SG-B484	NA	7653844	619001	484
	PDI-SG-B485	NA	7651921	618384	485
	PDI-SG-B486	NA	7651371	617890	486
	PDI-SG-B487	NA	7649957	616954	487
	PDI-SG-B488	NA	7648837	616092	488

**Table 2. Station Location Coordinates, Target Depth and Identification Scheme**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
SMA Targeted Samples and Co-Located Grab at Core Location	PDI-SG-S001	NA	7617962	725158	1
	PDI-SG-S003	-8.8	7617774	724960	3
	PDI-SG-S004	-3.1	7617674	724708	4
	PDI-SG-S005	-33.3	7617585	724728	5
	PDI-SG-S006	-17.4	7617459	724369	6
	PDI-SG-S007	NA	7617494	724204	7
	PDI-SG-S008	-30.9	7617311	724218	8
	PDI-SG-S009	-36.1	7617132	723879	9
	PDI-SG-S010	-23.9	7617252	723775	10
	PDI-SG-S011	-8.5	7617185	723519	11
	PDI-SG-S012	-25.5	7617100	723515	12
	PDI-SG-S013	-3.7	7617105	723218	13
	PDI-SG-S015	-33.0	7616871	722877	15
	PDI-SG-S016	NA	7616992	722625	16
	PDI-SG-S017	NA	7617004	722341	17
	PDI-SG-S018	-34.7	7616718	721797	18
	PDI-SG-S019	-26.8	7616724	721584	19
	PDI-SG-S020	-30.7	7616779	721392	20
	PDI-SG-S021	-8.2	7615798	717954	21
	PDI-SG-S023	-48.7	7617275	717743	23
	PDI-SG-S024	-38.7	7618163	717155	24
	PDI-SG-S025	-38.9	7618228	717187	25
	PDI-SG-S026	-37.7	7618422	717116	26
	PDI-SG-S027	-38.5	7618724	717137	27
	PDI-SG-S028	-24.5	7619022	717184	28
	PDI-SG-S029	-30.8	7619197	717136	29
	PDI-SG-S030	-13.6	7619376	717045	30
	PDI-SG-S031	-22.4	7619579	717144	31
	PDI-SG-S032	-9.2	7619801	717238	32
	PDI-SG-S035	NA	7617909	717010	35
	PDI-SG-S037	NA	7616630	715973	37
	PDI-SG-S038	NA	7616671	715750	38
	PDI-SG-S039	NA	7616637	715830	39
	PDI-SG-S040	NA	7618253	716288	40
	PDI-SG-S041	NA	7618335	715998	41
	PDI-SG-S043	NA	7618408	715790	43
	PDI-SG-S044	NA	7618567	715424	44
	PDI-SG-S046	-12.7	7617310	714320	46
	PDI-SG-S047	-13.1	7617451	714127	47
	PDI-SG-S048	-32.6	7619270	714453	48
	PDI-SG-S049	-33.1	7619381	714642	49
	PDI-SG-S050	-26.2	7619590	714679	50
	PDI-SG-S051	-35.1	7619847	714518	51
	PDI-SG-S052	-32.5	7620324	714504	52
	PDI-SG-S053	NA	7617469	713721	53
	PDI-SG-S054	NA	7619578	713891	54
	PDI-SG-S055	-9.3	7619660	713673	55
	PDI-SG-S056	-43.0	7619277	713512	56
	PDI-SG-S057	-45.8	7619774	713422	57
	PDI-SG-S058	-48.1	7620077	713409	58
	PDI-SG-S059	-45.9	7620409	713320	59
	PDI-SG-S060	-37.3	7620262	713166	60
	PDI-SG-S062	-12.4	7618175	712584	62
	PDI-SG-S063	NA	7618239	712311	63
	PDI-SG-S065	NA	7618588	711681	65
	PDI-SG-S067	-55.1	7619937	710437	67
	PDI-SG-S068	-50.2	7620270	710343	68
	PDI-SG-S069	-47.6	7620058	710153	69
	PDI-SG-S070	-9.7	7619684	710016	70
	PDI-SG-S071	-47.2	7620330	710027	71
	PDI-SG-S072	NA	7620015	709542	72
	PDI-SG-S073	-47.3	7620604	709562	73

**Table 2. Station Location Coordinates, Target Depth and Identification Scheme**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
SMA Targeted Samples and Co-Located Grab at Core Location	PDI-SG-S074	NA	7620318	709148	74
	PDI-SG-S075	-51.7	7620889	709462	75
	PDI-SG-S076	-51.5	7620959	709256	76
	PDI-SG-S077	-46.9	7620850	709047	77
	PDI-SG-S078	-12.4	7620681	708691	78
	PDI-SG-S079	-29.8	7621671	709096	79
	PDI-SG-S080	NA	7620966	708439	80
	PDI-SG-S081	-47.0	7621546	708371	81
	PDI-SG-S083	-50.6	7621575	708069	83
	PDI-SG-S084	-46.2	7621841	708209	84
	PDI-SG-S085	NA	7622302	708578	85
	PDI-SG-S086	-50.8	7621839	707824	86
	PDI-SG-S087	-47.4	7622061	708072	87
	PDI-SG-S088	-36.9	7622381	708290	88
	PDI-SG-S089	NA	7622526	708390	89
	PDI-SG-S090	-50.9	7622191	707841	90
	PDI-SG-S091	-50.7	7622058	707627	91
	PDI-SG-S092	NA	7622708	708151	92
	PDI-SG-S093	-4.5	7622856	708005	93
	PDI-SG-S094	-44.3	7622108	707246	94
	PDI-SG-S096	-44.5	7622449	706904	96
	PDI-SG-S097	NA	7623213	707640	97
	PDI-SG-S098	-45.6	7622652	706762	98
	PDI-SG-S099	NA	7623366	707452	99
	PDI-SG-S100	-36.4	7623469	707232	100
	PDI-SG-S101	-33.7	7622807	706535	101
	PDI-SG-S102	-13.3	7622987	706299	102
	PDI-SG-S103	-39.8	7623053	706373	103
	PDI-SG-S104	-17.8	7623732	707138	104
	PDI-SG-S106	-28.4	7623244	706172	106
	PDI-SG-S107	-48.9	7623633	706524	107
	PDI-SG-S108	-11.3	7623957	706997	108
	PDI-SG-S109	-44.6	7623821	706069	109
	PDI-SG-S110	-45.0	7623993	706161	110
	PDI-SG-S111	-7.8	7624552	706647	111
	PDI-SG-S113	-40.5	7624300	705634	113
	PDI-SG-S114	-6.4	7624971	706405	114
	PDI-SG-S115	NA	7625201	706314	115
	PDI-SG-S116	-44.0	7624706	705477	116
	PDI-SG-S118	-36.1	7624857	705237	118
	PDI-SG-S119	NA	7625423	706207	119
	PDI-SG-S120	NA	7625707	706105	120
	PDI-SG-S122	NA	7625993	706005	122
	PDI-SG-S123	-46.2	7625575	705191	123
	PDI-SG-S124	NA	7626287	705944	124
	PDI-SG-S125	-47.2	7625815	704974	125
	PDI-SG-S126	-37.3	7626498	705491	126
	PDI-SG-S128	-44.5	7626449	705211	128
	PDI-SG-S130	-19.7	7626998	705811	130
	PDI-SG-S131	-31.6	7626895	705603	131
	PDI-SG-S132	-44.5	7626776	704897	132

**Table 2. Station Location Coordinates, Target Depth and Identification Scheme**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
SMA Targeted Samples and Co-Located Grab at Core Location	PDI-SG-S133	-12.5	7627283	705708	133
	PDI-SG-S134	-10.6	7627197	705455	134
	PDI-SG-S135	-11.1	7626327	704105	135
	PDI-SG-S136	NA	7626539	703726	136
	PDI-SG-S137	-30.7	7626783	703800	137
	PDI-SG-S138	NA	7626673	703544	138
	PDI-SG-S139	-7.4	7627058	703342	139
	PDI-SG-S141	-31.1	7627417	703218	141
	PDI-SG-S142	NA	7627256	702998	142
	PDI-SG-S143	NA	7628385	704101	143
	PDI-SG-S144	NA	7628759	704114	144
	PDI-SG-S145	-4.4	7628619	703926	145
	PDI-SG-S146	-16.4	7627591	702896	146
	PDI-SG-S147	NA	7628828	703730	147
	PDI-SG-S148	-32.4	7627852	702737	148
	PDI-SG-S149	NA	7629051	703559	149
	PDI-SG-S150	-22.5	7628009	702448	150
	PDI-SG-S151	-28.8	7628124	702359	151
	PDI-SG-S152	-5.5	7629314	703468	152
	PDI-SG-S153	-19.5	7628346	702020	153
	PDI-SG-S155	NA	7628616	701529	155
	PDI-SG-S156	NA	7628438	701362	156
	PDI-SG-S157	-37.9	7628992	700980	157
	PDI-SG-S158	-37.5	7629029	701025	158
	PDI-SG-S159	-35.7	7629045	700756	159
	PDI-SG-S160	-34.7	7628840	700429	160
	PDI-SG-S161	-43.8	7629277	700787	161
	PDI-SG-S162	-30.0	7629439	700575	162
	PDI-SG-S163	-25.8	7629268	700352	163
	PDI-SG-S164	NA	7630027	699988	164
	PDI-SG-S165	-22.3	7630320	699722	165
	PDI-SG-S166	NA	7630506	699312	166
	PDI-SG-S167	NA	7631607	700518	167
	PDI-SG-S168	-57.2	7631788	700713	168
	PDI-SG-S169	-35.7	7632329	701317	169
	PDI-SG-S170	-32.8	7632550	701510	170
	PDI-SG-S171	-38.2	7632034	700861	171
	PDI-SG-S172	-13.1	7633011	701895	172
	PDI-SG-S173	-35.8	7632837	701598	173
	PDI-SG-S174	-33.7	7632356	701008	174
	PDI-SG-S175	NA	7631874	700472	175
	PDI-SG-S176	-43.3	7632595	701151	176
	PDI-SG-S177	-27.1	7633185	701785	177
	PDI-SG-S178	-34.4	7632913	701345	178
	PDI-SG-S179	-41.5	7632407	700715	179
	PDI-SG-S180	-34.8	7633170	701488	180
	PDI-SG-S181	-43.9	7632004	699997	181
	PDI-SG-S182	-6.6	7632396	700484	182
	PDI-SG-S183	NA	7632704	700806	183
	PDI-SG-S184	-41.3	7632961	700963	184
	PDI-SG-S186	-24.4	7633614	701704	186
	PDI-SG-S187	NA	7633179	701191	187
	PDI-SG-S190	NA	7630934	698950	190
	PDI-SG-S191	-47.5	7632893	700640	191
	PDI-SG-S193	-26.3	7633802	701392	193
	PDI-SG-S194	-33.4	7633678	701117	194
	PDI-SG-S195	-19.1	7631432	698400	195
	PDI-SG-S196	NA	7631252	698150	196
	PDI-SG-S197	-25.3	7631721	698306	197
	PDI-SG-S198	-33.3	7633962	701063	198

**Table 2. Station Location Coordinates, Target Depth and Identification Scheme**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
SMA Targeted Samples and Co-Located Grab at Core Location	PDI-SG-S199	-13.8	7634144	701260	199
	PDI-SG-S200	-30.6	7634163	700984	200
	PDI-SG-S201	-32.3	7633972	700776	201
	PDI-SG-S202	-25.0	7631941	698099	202
	PDI-SG-S203	-34.6	7634188	700563	203
	PDI-SG-S204	-17.6	7634615	700797	204
	PDI-SG-S205	-11.9	7632159	697893	205
	PDI-SG-S206	NA	7631956	697410	206
	PDI-SG-S207	-15.8	7632379	697685	207
	PDI-SG-S208	-31.8	7634586	700379	208
	PDI-SG-S209	-16.2	7632574	697494	209
	PDI-SG-S210	NA	7632397	697249	210
	PDI-SG-S211	-33.0	7634779	700168	211
	PDI-SG-S212	-18.4	7632756	697315	212
	PDI-SG-S213	-31.8	7634983	700093	213
	PDI-SG-S214	-4.1	7635223	700365	214
	PDI-SG-S215	-32.6	7635087	699826	215
	PDI-SG-S216	-27.1	7635297	699938	216
	PDI-SG-S217	-27.8	7633143	697044	217
	PDI-SG-S218	NA	7633085	696851	218
	PDI-SG-S220	-25.5	7635617	699936	220
	PDI-SG-S221	-28.8	7633359	696916	221
	PDI-SG-S222	-13.4	7633418	696810	222
	PDI-SG-S223	-23.8	7635704	699686	223
	PDI-SG-S224	-11.8	7635931	699880	224
	PDI-SG-S225	-22.4	7635739	699426	225
	PDI-SG-S226	NA	7633678	696609	226
	PDI-SG-S227	-16.2	7634098	696455	227
	PDI-SG-S228	-17.1	7635600	697287	228
	PDI-SG-S229	NA	7635857	699177	229
	PDI-SG-S230	-23.0	7636127	699520	230
	PDI-SG-S231	-22.2	7636042	699323	231
	PDI-SG-S233	-20.1	7636405	699407	233
	PDI-SG-S234	-18.8	7636304	698916	234
	PDI-SG-S235	-17.3	7636477	699072	235
	PDI-SG-S236	-15.4	7636643	699219	236
	PDI-SG-S237	-22.7	7634664	696106	237
	PDI-SG-S238	-14.1	7636448	698736	238
	PDI-SG-S239	-13.7	7636758	698962	239
	PDI-SG-S240	NA	7636937	699125	240
	PDI-SG-S241	-11.0	7636654	698747	241
	PDI-SG-S242	NA	7636706	698454	242
	PDI-SG-S243	-19.7	7635786	697156	243
	PDI-SG-S244	-17.3	7635278	695747	244
	PDI-SG-S246	-16.7	7635733	695499	246
	PDI-SG-S247	-19.5	7636119	695233	247
	PDI-SG-S248	-20.4	7636288	695194	248
	PDI-SG-S249	-18.3	7636390	695094	249
	PDI-SG-S250	-19.8	7636627	695076	250
	PDI-SG-S252	-19.4	7637602	696024	252
	PDI-SG-S253	-14.8	7637107	694684	253
	PDI-SG-S254	-23.4	7637333	694600	254
	PDI-SG-S255	NA	7637134	694051	255
	PDI-SG-S256	NA	7637282	694038	256
	PDI-SG-S257	-16.8	7637494	694352	257
	PDI-SG-S258	-28.7	7639814	694670	258

**Table 2. Station Location Coordinates, Target Depth and Identification Scheme**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
SMA Targeted Samples and Co-Located Grab at Core Location	PDI-SG-S259	-35.7	7640001	694255	259
	PDI-SG-S261	-20.3	7639895	692466	261
	PDI-SG-S262	-2.6	7641772	691790	262
	PDI-SG-S263	NA	7642066	691479	263
	PDI-SG-S264		-- <sup>d</sup>		264
	PDI-SG-S265		-- <sup>d</sup>		265
	PDI-SG-S266		-- <sup>d</sup>		266
	PDI-SG-S267		-- <sup>d</sup>		267
	PDI-SG-S268		-- <sup>d</sup>		268

**General Notes:**

1. All surface sediment samples have a target depth of 30 cm.
2. Conversion From CRD to NAVD88: Elevation (CRD) +5.38 ≈ NAVD88 (Geoid12b)
3. NA = not available

**Footnotes:**

a) Vertical Datum: CRD (Columbia River Datum; Feet); based on 2009 NOAA bathymetry

b) Horizontal Projection: NAD83 (2011), State Plane Coordinate System (SPCS) Oregon North Zone (Intl Feet)

c) Upriver surface sediment samples will target fine grain materials following field recognition. These locations are draft and may be updated following these efforts.

d) Five SMA and four Core Locations samples pulled from River Mile 11E area will be redistributed and confirmed at a later date.

**Table 3. Station Location Coordinates, Target Depth and Identification Scheme - Alternative 1 Locations**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B001-BL1	NA	7612929	720099	001
	PDI-SG-B002-BL1	-36.6	7613969	720178	002
	PDI-SG-B003-BL1	-51.3	7614466	720153	003
	PDI-SG-B004-BL1	-19.2	7619617	717192	004
	PDI-SG-B005-BL1	-38.3	7618173	717197	005
	PDI-SG-B006-BL1	-29.5	7620330	714535	006
	PDI-SG-B007-BL1	-5.9	7619242	714740	007
	PDI-SG-B008-BL1	NA	7619714	713066	008
	PDI-SG-B009-BL1	-46.4	7616834	725513	009
	PDI-SG-B010-BL1	-48.2	7616324	724498	010
	PDI-SG-B011-BL1	-45.1	7615893	723608	011
	PDI-SG-B012-BL1	-39.5	7615638	722897	012
	PDI-SG-B013-BL1	-50.1	7615763	721835	013
	PDI-SG-B014-BL1	-44.5	7616034	720422	014
	PDI-SG-B015-BL1	-42.8	7616134	719107	015
	PDI-SG-B016-BL1	-45.4	7616233	719099	016
	PDI-SG-B017-BL1	-47.6	7616789	717713	017
	PDI-SG-B018-BL1	-44.6	7616931	716481	018
	PDI-SG-B019-BL1	-49.5	7617647	715360	019
	PDI-SG-B020-BL1	-42.7	7617617	714647	020
	PDI-SG-B021-BL1	-58.1	7618291	713543	021
	PDI-SG-B022-BL1	-48.0	7618316	712888	022
	PDI-SG-B023-BL1	-47.8	7619042	711844	023
	PDI-SG-B024-BL1	-50.0	7619647	710794	024
	PDI-SG-B025-BL1	-47.8	7620057	710167	025
	PDI-SG-B026-BL1	-46.8	7620826	708953	026
	PDI-SG-B027-BL1	-35.6	7621531	707901	027
	PDI-SG-B028-BL1	-50.9	7622093	707770	028
	PDI-SG-B029-BL1	-44.0	7622824	706947	029
	PDI-SG-B030-BL1	-43.1	7623967	706092	030
	PDI-SG-B031-BL1	-45.9	7624625	705680	031
	PDI-SG-B032-BL1	-46.3	7625402	705067	032
	PDI-SG-B033-BL1	-40.5	7626717	704113	033
	PDI-SG-B034-BL1	-38.0	7626943	703820	034
	PDI-SG-B035-BL1	-38.6	7628137	702711	035
	PDI-SG-B036-BL1	-36.4	7628268	702468	036
	PDI-SG-B037-BL1	-47.1	7629501	701503	037
	PDI-SG-B038-BL1	-37.8	7630144	700524	038
	PDI-SG-B039-BL1	-25.7	7630748	699445	039
	PDI-SG-B040-BL1	-26.1	7631032	699281	040
	PDI-SG-B041-BL1	-24.1	7632021	698079	041
	PDI-SG-B042-BL1	-32.0	7633119	697397	042
	PDI-SG-B043-BL1	-27.9	7633710	696954	043
	PDI-SG-B044-BL1	-35.5	7634762	696879	044
	PDI-SG-B045-BL1	-12.2	7635587	695877	045
	PDI-SG-B046-BL1	-26.0	7636509	695510	046
	PDI-SG-B047-BL1	-40.9	7637901	694961	047
	PDI-SG-B048-BL1	-43.8	7638906	694424	048
	PDI-SG-B049-BL1	-40.7	7638987	694039	049
	PDI-SG-B050-BL1	-34.3	7639601	692933	050
	PDI-SG-B051-BL1	-47.9	7640452	692522	051
	PDI-SG-B052-BL1	-49.3	7641340	691107	052
	PDI-SG-B053-BL1	-55.6	7641722	690886	053
	PDI-SG-B054-BL1	-41.6	7642872	689479	054
	PDI-SG-B055-BL1	-35.8	7642856	689371	055
	PDI-SG-B056-BL1	-33.5	7644246	687969	056

**Table 3. Station Location Coordinates, Target Depth and Identification Scheme - Alternative 1 Locations**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B057-BL1	-36.3	7644431	687770	057
	PDI-SG-B058-BL1	-40.1	7644898	687515	058
	PDI-SG-B059-BL1	-47.7	7616840	725267	059
	PDI-SG-B060-BL1	-40.2	7616828	724825	060
	PDI-SG-B061-BL1	-36.0	7616613	724202	061
	PDI-SG-B062-BL1	-49.0	7615976	722710	062
	PDI-SG-B063-BL1	-44.7	7616149	721897	063
	PDI-SG-B064-BL1	-42.2	7616293	720801	064
	PDI-SG-B065-BL1	-44.6	7616596	719209	065
	PDI-SG-B066-BL1	-44.8	7616677	719147	066
	PDI-SG-B067-BL1	-49.2	7617212	717245	067
	PDI-SG-B068-BL1	-38.7	7617742	716682	068
	PDI-SG-B069-BL1	-48.2	7617760	716331	069
	PDI-SG-B070-BL1	-60.6	7618192	715284	070
	PDI-SG-B071-BL1	-30.5	7618937	714212	071
	PDI-SG-B072-BL1	-73.0	7619093	712427	072
	PDI-SG-B073-BL1	-68.3	7619595	711690	073
	PDI-SG-B074-BL1	-76.6	7619897	710892	074
	PDI-SG-B075-BL1	-48.9	7620326	710249	075
	PDI-SG-B076-BL1	-50.6	7621444	709213	076
	PDI-SG-B077-BL1	-45.5	7621842	708527	077
	PDI-SG-B078-BL1	-43.3	7622427	708191	078
	PDI-SG-B079-BL1	-45.1	7622987	707129	079
	PDI-SG-B080-BL1	-45.5	7624057	706156	080
	PDI-SG-B081-BL1	-43.4	7625102	705546	081
	PDI-SG-B082-BL1	-44.9	7625745	705233	082
	PDI-SG-B083-BL1	-45.6	7626979	704305	083
	PDI-SG-B084-BL1	-51.5	7627738	703693	084
	PDI-SG-B085-BL1	-44.5	7627758	703422	085
	PDI-SG-B086-BL1	-57.4	7628985	702636	086
	PDI-SG-B087-BL1	-48.7	7629442	701749	087
	PDI-SG-B088-BL1	-48.8	7630865	701413	088
	PDI-SG-B089-BL1	-37.7	7631753	701154	089
	PDI-SG-B090-BL1	-45.1	7631571	699513	090
	PDI-SG-B091-BL1	-46.3	7632718	699317	091
	PDI-SG-B092-BL1	-36.0	7633422	697819	092
	PDI-SG-B093-BL1	-40.7	7633843	697732	093
	PDI-SG-B094-BL1	-38.6	7635096	696737	094
	PDI-SG-B095-BL1	-69.6	7636321	696317	095
	PDI-SG-B096-BL1	-58.1	7636640	695901	096
	PDI-SG-B097-BL1	-72.7	7637453	695560	097
	PDI-SG-B098-BL1	-42.4	7638855	695037	098
	PDI-SG-B099-BL1	-56.7	7639100	694608	099
	PDI-SG-B100-BL1	-47.0	7640283	692875	100
	PDI-SG-B101-BL1	-46.8	7640372	692794	101
	PDI-SG-B102-BL1	-39.1	7641457	691916	102
	PDI-SG-B103-BL1	-39.0	7642061	691179	103
	PDI-SG-B104-BL1	-50.9	7642919	689973	104
	PDI-SG-B105-BL1	-45.5	7643685	689215	105
	PDI-SG-B106-BL1	-43.7	7643853	688915	106
	PDI-SG-B107-BL1	-46.3	7644650	688183	107
	PDI-SG-B108-BL1	-41.9	7644975	687591	108
	PDI-SG-B109-BL1	-8.4	7616282	726265	109
	PDI-SG-B110-BL1	-40.3	7616548	725688	110
	PDI-SG-B111-BL1	-4.1	7616027	725914	111
	PDI-SG-B112-BL1	NA	7615753	725445	112
	PDI-SG-B113-BL1	-9.7	7615754	725273	113

**Table 3. Station Location Coordinates, Target Depth and Identification Scheme - Alternative 1 Locations**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B114-BL1	NA	7615498	724994	114
	PDI-SG-B115-BL1	-38.5	7615786	724386	115
	PDI-SG-B116-BL1	-20.3	7615559	724181	116
	PDI-SG-B117-BL1	NA	7615067	723486	117
	PDI-SG-B118-BL1	NA	7615207	723116	118
	PDI-SG-B119-BL1	-30.8	7615550	722962	119
	PDI-SG-B120-BL1	NA	7615134	722411	120
	PDI-SG-B121-BL1	-54.4	7615504	721924	121
	PDI-SG-B122-BL1	-52.5	7615483	721913	122
	PDI-SG-B123-BL1	-12.7	7615319	721258	123
	PDI-SG-B124-BL1	-31.3	7615590	720897	124
	PDI-SG-B125-BL1	-32.0	7615714	720571	125
	PDI-SG-B126-BL1	-28.2	7615680	720389	126
	PDI-SG-B127-BL1	-25.4	7615742	719872	127
	PDI-SG-B128-BL1	-35.6	7615880	719503	128
	PDI-SG-B129-BL1	-26.3	7615758	719031	129
	PDI-SG-B130-BL1	-37.2	7615994	719055	130
	PDI-SG-B131-BL1	-36.9	7616125	718525	131
	PDI-SG-B132-BL1	-38.7	7616195	718362	132
	PDI-SG-B133-BL1	NA	7615865	717798	133
	PDI-SG-B134-BL1	-17.6	7615987	717524	134
	PDI-SG-B135-BL1	-34.0	7616359	717117	135
	PDI-SG-B136-BL1	-16.8	7616310	716792	136
	PDI-SG-B137-BL1	NA	7616366	716515	137
	PDI-SG-B138-BL1	NA	7616460	716230	138
	PDI-SG-B139-BL1	NA	7616563	715705	139
	PDI-SG-B140-BL1	-17.1	7616929	715258	140
	PDI-SG-B141-BL1	NA	7616885	715150	141
	PDI-SG-B142-BL1	NA	7617056	714711	142
	PDI-SG-B143-BL1	-10.9	7617224	714484	143
	PDI-SG-B144-BL1	-20.5	7617415	714229	144
	PDI-SG-B145-BL1	NA	7617398	713848	145
	PDI-SG-B146-BL1	NA	7617583	713403	146
	PDI-SG-B147-BL1	NA	7617855	713159	147
	PDI-SG-B148-BL1	NA	7617948	712921	148
	PDI-SG-B149-BL1	NA	7618223	712350	149
	PDI-SG-B150-BL1	NA	7618336	711984	150
	PDI-SG-B151-BL1	NA	7618580	711643	151
	PDI-SG-B152-BL1	NA	7618574	711553	152
	PDI-SG-B153-BL1	-32.6	7618972	711176	153
	PDI-SG-B154-BL1	-10.4	7619079	710896	154
	PDI-SG-B155-BL1	-26.7	7619323	710561	155
	PDI-SG-B156-BL1	NA	7619440	710192	156
	PDI-SG-B157-BL1	-5.8	7619625	710052	157
	PDI-SG-B158-BL1	NA	7619869	709722	158
	PDI-SG-B159-BL1	NA	7620050	709523	159
	PDI-SG-B160-BL1	-34.2	7620420	709163	160
	PDI-SG-B161-BL1	-27.9	7620528	708977	161
	PDI-SG-B162-BL1	-9.7	7620734	708599	162
	PDI-SG-B163-BL1	-23.0	7621032	708377	163
	PDI-SG-B164-BL1	NA	7621349	707871	164
	PDI-SG-B165-BL1	NA	7621573	707640	165
	PDI-SG-B166-BL1	-15.7	7621794	707491	166
	PDI-SG-B167-BL1	NA	7621891	707220	167
	PDI-SG-B168-BL1	-45.2	7622401	706943	168
	PDI-SG-B169-BL1	-37.9	7622565	706751	169
	PDI-SG-B170-BL1	-12.8	7622810	706381	170

**Table 3. Station Location Coordinates, Target Depth and Identification Scheme - Alternative 1 Locations**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B171-BL1	-6.1	7623062	706155	171
	PDI-SG-B172-BL1	-31.7	7623557	705973	172
	PDI-SG-B173-BL1	NA	7623676	705840	173
	PDI-SG-B174-BL1	-24.4	7624153	705605	174
	PDI-SG-B175-BL1	NA	7624299	705466	175
	PDI-SG-B176-BL1	-3.5	7624671	705246	176
	PDI-SG-B177-BL1	-20.2	7624975	705116	177
	PDI-SG-B178-BL1	-27.5	7625318	704948	178
	PDI-SG-B179-BL1	-3.7	7625620	704680	179
	PDI-SG-B180-BL1	-8.3	7625880	704515	180
	PDI-SG-B181-BL1	-29.9	7626210	704386	181
	PDI-SG-B182-BL1	-19.8	7626312	704207	182
	PDI-SG-B183-BL1	-14.8	7626453	703983	183
	PDI-SG-B184-BL1	NA	7626591	703548	184
	PDI-SG-B185-BL1	NA	7626777	703403	185
	PDI-SG-B186-BL1	NA	7627211	703069	186
	PDI-SG-B187-BL1	-9.0	7627368	703058	187
	PDI-SG-B188-BL1	NA	7627571	702828	188
	PDI-SG-B189-BL1	-22.7	7628019	702441	189
	PDI-SG-B190-BL1	-27.1	7628264	702193	190
	PDI-SG-B191-BL1	NA	7628289	701973	191
	PDI-SG-B192-BL1	NA	7628414	701345	192
	PDI-SG-B193-BL1	-22.0	7628526	700942	193
	PDI-SG-B194-BL1	-24.7	7628722	700916	194
	PDI-SG-B195-BL1	-35.9	7628885	700698	195
	PDI-SG-B196-BL1	-35.6	7629321	700605	196
	PDI-SG-B197-BL1	-21.5	7629528	700306	197
	PDI-SG-B198-BL1	-11.1	7629819	700145	198
	PDI-SG-B199-BL1	NA	7629925	699940	199
	PDI-SG-B200-BL1	NA	7630275	699607	200
	PDI-SG-B201-BL1	-6.5	7630570	699329	201
	PDI-SG-B202-BL1	-19.9	7630930	699099	202
	PDI-SG-B203-BL1	-4.2	7630943	699010	203
	PDI-SG-B204-BL1	-19.7	7631334	698692	204
	PDI-SG-B205-BL1	-8.9	7631448	698120	205
	PDI-SG-B206-BL1	NA	7631581	697684	206
	PDI-SG-B207-BL1	-11.4	7632007	697635	207
	PDI-SG-B208-BL1	-10.2	7632493	697410	208
	PDI-SG-B209-BL1	-16.4	7632655	697416	209
	PDI-SG-B210-BL1	NA	7632910	696982	210
	PDI-SG-B211-BL1	NA	7633191	696720	211
	PDI-SG-B212-BL1	NA	7633527	696705	212
	PDI-SG-B213-BL1	NA	7633835	696553	213
	PDI-SG-B214-BL1	-12.1	7634284	696334	214
	PDI-SG-B215-BL1	NA	7634495	696094	215
	PDI-SG-B216-BL1	-21.5	7634982	695901	216
	PDI-SG-B217-BL1	-12.9	7635226	695746	217
	PDI-SG-B218-BL1	-15.7	7635570	695775	218
	PDI-SG-B219-BL1	-13.7	7635788	695679	219
	PDI-SG-B220-BL1	-17.8	7636074	695414	220
	PDI-SG-B221-BL1	-13.0	7636408	695327	221
	PDI-SG-B222-BL1	-14.8	7636693	695127	222
	PDI-SG-B223-BL1	-16.5	7637093	694794	223
	PDI-SG-B224-BL1	NA	7637292	694264	224
	PDI-SG-B225-BL1	-32.2	7638037	694350	225
	PDI-SG-B226-BL1	-30.1	7638085	694278	226
	PDI-SG-B227-BL1	NA	7637203	694035	227

**Table 3. Station Location Coordinates, Target Depth and Identification Scheme - Alternative 1 Locations**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B228-BL1	-36.1	7638510	693888	228
	PDI-SG-B229-BL1	-36.8	7638613	693822	229
	PDI-SG-B230-BL1	-36.3	7638943	693510	230
	PDI-SG-B231-BL1	-37.4	7639150	693318	231
	PDI-SG-B232-BL1	-35.3	7639332	693108	232
	PDI-SG-B233-BL1	-37.5	7639484	692969	233
	PDI-SG-B234-BL1	-20.0	7639712	692695	234
	PDI-SG-B235-BL1	-20.6	7640014	692316	235
	PDI-SG-B236-BL1	-28.3	7640285	691985	236
	PDI-SG-B237-BL1	-23.9	7640528	691693	237
	PDI-SG-B238-BL1	-19.7	7640529	691656	238
	PDI-SG-B239-BL1	-20.8	7640897	691176	239
	PDI-SG-B240-BL1	-23.2	7640945	690921	240
	PDI-SG-B241-BL1	-19.6	7641371	690628	241
	PDI-SG-B242-BL1	NA	7641435	690512	242
	PDI-SG-B243-BL1	-13.4	7641748	690227	243
	PDI-SG-B244-BL1	-24.4	7641948	690045	244
	PDI-SG-B245-BL1	NA	7642161	689705	245
	PDI-SG-B246-BL1	-12.3	7642660	689274	246
	PDI-SG-B247-BL1	-4.1	7642694	689207	247
	PDI-SG-B248-BL1	NA	7643138	688756	248
	PDI-SG-B249-BL1	NA	7643332	688552	249
	PDI-SG-B250-BL1	NA	7643508	688418	250
	PDI-SG-B251-BL1	-6.9	7643945	688074	251
	PDI-SG-B252-BL1	NA	7643943	687996	252
	PDI-SG-B253-BL1	-16.3	7644250	687763	253
	PDI-SG-B254-BL1	-37.7	7644638	687489	254
	PDI-SG-B255-BL1	-26.4	7644738	687246	255
	PDI-SG-B256-BL1	-47.4	7644945	687133	256
	PDI-SG-B257-BL1	NA	7645143	686734	257
	PDI-SG-B258-BL1	-34.2	7645483	686475	258
	PDI-SG-B259-BL1	-29.3	7617839	725352	259
	PDI-SG-B260-BL1	-44.0	7617485	725360	260
	PDI-SG-B261-BL1	-40.3	7617395	725031	261
	PDI-SG-B262-BL1	-46.1	7617191	724938	262
	PDI-SG-B263-BL1	-34.6	7616902	724555	263
	PDI-SG-B264-BL1	-36.0	7617081	724238	264
	PDI-SG-B265-BL1	-36.4	7617143	723919	265
	PDI-SG-B266-BL1	-19.0	7617188	723606	266
	PDI-SG-B267-BL1	-35.6	7616625	723277	267
	PDI-SG-B268-BL1	-22.8	7616976	722999	268
	PDI-SG-B269-BL1	-27.6	7616881	722557	269
	PDI-SG-B270-BL1	-44.3	7616353	722247	270
	PDI-SG-B271-BL1	-25.3	7616771	722025	271
	PDI-SG-B272-BL1	-45.2	7616411	721789	272
	PDI-SG-B273-BL1	-39.1	7616374	721310	273
	PDI-SG-B274-BL1	-35.2	7616734	721093	274
	PDI-SG-B275-BL1	-31.7	7616767	720949	275
	PDI-SG-B276-BL1	-40.0	7616628	720538	276
	PDI-SG-B277-BL1	-37.8	7616789	720115	277
	PDI-SG-B278-BL1	-35.5	7616853	719764	278
	PDI-SG-B279-BL1	-31.8	7616890	719611	279
	PDI-SG-B280-BL1	-44.7	7616808	719129	280
	PDI-SG-B281-BL1	NA	7617165	718875	281
	PDI-SG-B282-BL1	-23.6	7617243	718457	282
	PDI-SG-B283-BL1	-27.9	7617337	718102	283
	PDI-SG-B284-BL1	-37.4	7617502	717637	284

**Table 3. Station Location Coordinates, Target Depth and Identification Scheme - Alternative 1 Locations**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B285-BL1	-27.0	7617585	717530	285
	PDI-SG-B286-BL1	NA	7617977	717009	286
	PDI-SG-B287-BL1	-31.9	7617797	716947	287
	PDI-SG-B288-BL1	-33.0	7617927	716563	288
	PDI-SG-B289-BL1	-20.6	7618167	716262	289
	PDI-SG-B290-BL1	NA	7618345	715904	290
	PDI-SG-B291-BL1	NA	7618377	715790	291
	PDI-SG-B292-BL1	-50.7	7618443	715354	292
	PDI-SG-B293-BL1	-39.2	7618599	715081	293
	PDI-SG-B294-BL1	-37.6	7618808	714622	294
	PDI-SG-B295-BL1	-35.5	7618974	714476	295
	PDI-SG-B296-BL1	-8.3	7619226	713958	296
	PDI-SG-B297-BL1	-13.9	7619330	713818	297
	PDI-SG-B298-BL1	-18.4	7619469	713611	298
	PDI-SG-B299-BL1	-22.6	7619606	713081	299
	PDI-SG-B300-BL1	-26.7	7619647	712853	300
	PDI-SG-B301-BL1	-36.4	7619765	712468	301
	PDI-SG-B302-BL1	-40.6	7619818	712318	302
	PDI-SG-B303-BL1	-40.9	7620012	711902	303
	PDI-SG-B304-BL1	-21.4	7620382	711469	304
	PDI-SG-B305-BL1	NA	7620566	711189	305
	PDI-SG-B306-BL1	NA	7620622	711111	306
	PDI-SG-B307-BL1	NA	7620677	710781	307
	PDI-SG-B308-BL1	-28.7	7620899	710478	308
	PDI-SG-B309-BL1	-27.6	7621101	710130	309
	PDI-SG-B310-BL1	-28.1	7621340	709673	310
	PDI-SG-B311-BL1	-9.4	7621536	709473	311
	PDI-SG-B312-BL1	-32.3	7621684	709069	312
	PDI-SG-B313-BL1	-31.3	7621763	708984	313
	PDI-SG-B314-BL1	NA	7622166	708861	314
	PDI-SG-B315-BL1	-42.7	7622246	708386	315
	PDI-SG-B316-BL1	-41.6	7622400	708246	316
	PDI-SG-B317-BL1	-43.0	7622686	707913	317
	PDI-SG-B318-BL1	-24.4	7622884	707841	318
	PDI-SG-B319-BL1	-46.7	7623202	707260	319
	PDI-SG-B320-BL1	-15.1	7623591	707240	320
	PDI-SG-B321-BL1	-49.1	7623615	706891	321
	PDI-SG-B322-BL1	-54.3	7623717	706792	322
	PDI-SG-B323-BL1	NA	7624373	706838	323
	PDI-SG-B324-BL1	-43.2	7624338	706531	324
	PDI-SG-B325-BL1	-5.1	7625010	706395	325
	PDI-SG-B326-BL1	-44.6	7625116	705880	326
	PDI-SG-B327-BL1	-43.7	7625362	705714	327
	PDI-SG-B328-BL1	-44.6	7625695	705666	328
	PDI-SG-B329-BL1	-14.2	7626309	705803	329
	PDI-SG-B330-BL1	-44.4	7626419	705408	330
	PDI-SG-B331-BL1	-25.6	7626962	705693	331
	PDI-SG-B332-BL1	-19.3	7626961	705341	332
	PDI-SG-B333-BL1	-40.4	7626985	704699	333
	PDI-SG-B334-BL1	-47.6	7627460	704408	334
	PDI-SG-B335-BL1	NA	7628062	704705	335
	PDI-SG-B336-BL1	NA	7628392	704299	336
	PDI-SG-B337-BL1	-52.4	7628310	703630	337
	PDI-SG-B338-BL1	-31.3	7628748	703617	338
	PDI-SG-B339-BL1	-61.0	7628761	703099	339
	PDI-SG-B340-BL1	-7.4	7629505	703373	340
	PDI-SG-B341-BL1	-33.2	7629516	702753	341

**Table 3. Station Location Coordinates, Target Depth and Identification Scheme - Alternative 1 Locations**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B342-BL1	-34.1	7629646	702719	342
	PDI-SG-B343-BL1	-26.4	7629938	702546	343
	PDI-SG-B344-BL1	-18.7	7630344	702345	344
	PDI-SG-B345-BL1	-19.5	7630526	702133	345
	PDI-SG-B346-BL1	-27.7	7630892	701871	346
	PDI-SG-B347-BL1	-13.6	7631191	701807	347
	PDI-SG-B348-BL1	-4.0	7631594	701663	348
	PDI-SG-B349-BL1	-30.1	7631861	701546	349
	PDI-SG-B350-BL1	-37.4	7632135	701356	350
	PDI-SG-B351-BL1	-44.5	7631715	700331	351
	PDI-SG-B352-BL1	-44.0	7632000	700026	352
	PDI-SG-B353-BL1	-41.7	7632075	699989	353
	PDI-SG-B354-BL1	-40.0	7632256	699842	354
	PDI-SG-B355-BL1	-43.9	7632657	699434	355
	PDI-SG-B356-BL1	-46.3	7632923	699176	356
	PDI-SG-B357-BL1	-46.5	7633102	699046	357
	PDI-SG-B358-BL1	-45.9	7633367	698840	358
	PDI-SG-B359-BL1	-37.3	7633688	698651	359
	PDI-SG-B360-BL1	-35.5	7633929	698505	360
	PDI-SG-B361-BL1	-16.7	7634149	698433	361
	PDI-SG-B362-BL1	-36.5	7634401	698094	362
	PDI-SG-B363-BL1	-7.1	7634747	697980	363
	PDI-SG-B364-BL1	-13.1	7634961	697805	364
	PDI-SG-B365-BL1	-25.5	7635457	697355	365
	PDI-SG-B366-BL1	-23.7	7635715	697179	366
	PDI-SG-B367-BL1	-25.7	7635856	697085	367
	PDI-SG-B368-BL1	-38.6	7636094	696824	368
	PDI-SG-B369-BL1	-18.2	7636499	696736	369
	PDI-SG-B370-BL1	-15.0	7636787	696509	370
	PDI-SG-B371-BL1	-27.7	7637010	696302	371
	PDI-SG-B372-BL1	-10.5	7637478	696152	372
	PDI-SG-B373-BL1	-24.3	7637545	696043	373
	PDI-SG-B374-BL1	-8.6	7637992	695792	374
	PDI-SG-B375-BL1	-23.0	7638277	695566	375
	PDI-SG-B376-BL1	NA	7638737	695594	376
	PDI-SG-B377-BL1	NA	7638928	695431	377
	PDI-SG-B378-BL1	-30.9	7639272	695012	378
	PDI-SG-B379-BL1	-33.4	7639664	694814	379
	PDI-SG-B380-BL1	-35.6	7639878	694462	380
	PDI-SG-B381-BL1	-36.6	7639952	694271	381
	PDI-SG-B382-BL1	-16.7	7640365	693728	382
	PDI-SG-B383-BL1	-37.5	7640328	693660	383
	PDI-SG-B384-BL1	-24.7	7640565	693293	384
	PDI-SG-B385-BL1	-32.6	7640731	692984	385
	PDI-SG-B386-BL1	-25.8	7640892	692805	386
	PDI-SG-B387-BL1	-22.5	7641123	692545	387
	PDI-SG-B388-BL1	-10.9	7641457	692142	388
	PDI-SG-B389-BL1	-31.8	7641600	691867	389
	PDI-SG-B390-BL1	-20.4	7641921	691545	390
	PDI-SG-B391-BL1	-28.0	7642133	691225	391
	PDI-SG-B392-BL1	-12.1	7642281	691121	392
	PDI-SG-B393-BL1	-25.5	7642466	690815	393
	PDI-SG-B394-BL1	-31.2	7642734	690472	394
	PDI-SG-B395-BL1	-39.9	7642982	690186	395
	PDI-SG-B396-BL1	-26.0	7643210	690030	396
	PDI-SG-B397-BL1	-27.6	7643583	689759	397
	PDI-SG-B398-BL1	-20.2	7643658	689753	398

**Table 3. Station Location Coordinates, Target Depth and Identification Scheme - Alternative 1 Locations**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B399-BL1	-44.1	7643882	689426	399
	PDI-SG-B400-BL1	-34.7	7644258	689173	400
	PDI-SG-B401-BL1	-38.3	7644488	689104	401
	PDI-SG-B402-BL1	-40.9	7644717	688741	402
	PDI-SG-B403-BL1	-35.6	7644893	688390	403
	PDI-SG-B404-BL1	-31.3	7645028	688138	404
	PDI-SG-B405-BL1	-39.7	7645197	687529	405
	PDI-SG-B406-BL1	-52.8	7645287	687204	406
	PDI-SG-B407-BL1	-57.1	7645398	687127	407
	PDI-SG-B408-BL1	-65.3	7645809	686741	408
	PDI-SG-B409-BL1	NA	7636585	698506	409
	PDI-SG-B410-BL1	-17.8	7636525	699214	410
	PDI-SG-B411-BL1	-20.9	7636206	699075	411
	PDI-SG-B412-BL1	-21.9	7636042	699289	412
	PDI-SG-B413-BL1	-22.7	7635728	699437	413
	PDI-SG-B414-BL1	-25.1	7635582	699715	414
	PDI-SG-B415-BL1	-28.8	7635119	700093	415
	PDI-SG-B416-BL1	-29.2	7635006	700392	416
	PDI-SG-B417-BL1	NA	7634966	700543	417
	PDI-SG-B418-BL1	-32.2	7634388	700659	418
	PDI-SG-B419-BL1	NA	7634298	701173	419
	PDI-SG-B420-BL1	-31.7	7633863	701183	420
	PDI-SG-B421-BL1	-33.4	7633606	701155	421
	PDI-SG-B422-BL1	-15.5	7633541	701819	422
	PDI-SG-B423-BL1	-16.6	7633029	701876	423
	PDI-SG-B424-BL1	-32.5	7632936	701293	424
	PDI-SG-B425-BL1	-36.0	7632377	701500	425
	PDI-SG-B426-BL1	-45.1	7632373	700926	426
	PDI-SG-B427-BL1	-37.5	7631944	700948	427
	PDI-SG-B428-BL1	-58.6	7632190	700343	428

**General Notes:**

1. All surface sediment samples have a target depth of 30 cm.
2. Conversion From CRD to NAVD88: Elevation (CRD) +5.38 ≈ NAVD88 (Geoid12b)
3. NA = not available

**Footnotes:**

- a) Vertical Datum: CRD (Columbia River Datum; Feet); based on 2009 NOAA bathymetry  
 b) Horizontal Projection: NAD83 (2011), State Plane Coordinate System (SPCS) Oregon North Zone (Intl Feet)

**Table 4. Station Location Coordinates, Target Depth and Identification Scheme - Alternative 2 Locations**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B001-BL1	-35.6	7612776	720637	001
	PDI-SG-B002-BL1	-29.5	7613524	720413	002
	PDI-SG-B003-BL1	-55.7	7614371	720298	003
	PDI-SG-B004-BL1	-2.1	7619062	717292	004
	PDI-SG-B005-BL1	-16.8	7618769	717243	005
	PDI-SG-B006-BL1	-11.7	7619703	714721	006
	PDI-SG-B007-BL1	-32.7	7619048	714611	007
	PDI-SG-B008-BL1	-29.7	7620299	713073	008
	PDI-SG-B009-BL1	-42.0	7616943	725971	009
	PDI-SG-B010-BL1	-52.3	7616077	724419	010
	PDI-SG-B011-BL1	-48.6	7616249	724341	011
	PDI-SG-B012-BL1	-41.1	7615701	723293	012
	PDI-SG-B013-BL1	-48.9	7615857	721824	013
	PDI-SG-B014-BL1	-44.9	7615985	721222	014
	PDI-SG-B015-BL1	-45.7	7616295	719143	015
	PDI-SG-B016-BL1	-46.6	7616412	718543	016
	PDI-SG-B017-BL1	-45.8	7616768	717643	017
	PDI-SG-B018-BL1	-52.3	7616995	716723	018
	PDI-SG-B019-BL1	-42.9	7617097	715812	019
	PDI-SG-B020-BL1	-42.3	7617575	714727	020
	PDI-SG-B021-BL1	-23.0	7617603	713892	021
	PDI-SG-B022-BL1	-51.2	7618313	712995	022
	PDI-SG-B023-BL1	-41.4	7618909	711696	023
	PDI-SG-B024-BL1	-59.2	7619735	710763	024
	PDI-SG-B025-BL1	-37.7	7619926	709916	025
	PDI-SG-B026-BL1	-46.2	7620552	709379	026
	PDI-SG-B027-BL1	-45.9	7621917	707875	027
	PDI-SG-B028-BL1	-50.8	7621933	707604	028
	PDI-SG-B029-BL1	-46.5	7622606	706919	029
	PDI-SG-B030-BL1	-43.9	7623883	706133	030
	PDI-SG-B031-BL1	-44.4	7625134	705332	031
	PDI-SG-B032-BL1	-41.4	7625612	704831	032
	PDI-SG-B033-BL1	-45.3	7626190	704676	033
	PDI-SG-B034-BL1	-43.4	7627193	703745	034
	PDI-SG-B035-BL1	-37.8	7627608	703221	035
	PDI-SG-B036-BL1	-35.7	7628485	702173	036
	PDI-SG-B037-BL1	-35.8	7629149	701427	037
	PDI-SG-B038-BL1	-40.9	7629773	701024	038
	PDI-SG-B039-BL1	-27.6	7630671	699562	039
	PDI-SG-B040-BL1	-38.8	7631675	699229	040
	PDI-SG-B041-BL1	-30.0	7631792	698299	041
	PDI-SG-B042-BL1	-31.6	7633229	697118	042
	PDI-SG-B043-BL1	-31.1	7633389	697203	043
	PDI-SG-B044-BL1	-23.7	7634223	696535	044
	PDI-SG-B045-BL1	-39.1	7635985	696156	045
	PDI-SG-B046-BL1	-48.8	7636727	695747	046
	PDI-SG-B047-BL1	-28.1	7637055	695181	047
	PDI-SG-B048-BL1	-42.9	7638584	694585	048
	PDI-SG-B049-BL1	-41.7	7639104	694120	049
	PDI-SG-B050-BL1	-46.3	7639919	693047	050
	PDI-SG-B051-BL1	-48.1	7640442	692040	051
	PDI-SG-B052-BL1	-30.6	7641006	691120	052
	PDI-SG-B053-BL1	-51.1	7641791	690581	053
	PDI-SG-B054-BL1	-46.7	7642173	689929	054

**Table 4. Station Location Coordinates, Target Depth and Identification Scheme - Alternative 2 Locations**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B055-BL1	-12.7	7643417	688613	055
	PDI-SG-B056-BL1	-33.9	7643759	688481	056
	PDI-SG-B057-BL1	-38.0	7644541	687828	057
	PDI-SG-B058-BL1	-45.3	7644976	687479	058
	PDI-SG-B059-BL1	-47.8	7617134	725466	059
	PDI-SG-B060-BL1	-46.2	7616619	724841	060
	PDI-SG-B061-BL1	-39.7	7616377	723696	061
	PDI-SG-B062-BL1	-43.2	7616263	723293	062
	PDI-SG-B063-BL1	-48.0	7615916	721814	063
	PDI-SG-B064-BL1	-43.3	7616154	720599	064
	PDI-SG-B065-BL1	-46.8	7616640	719704	065
	PDI-SG-B066-BL1	-46.0	7616798	718408	066
	PDI-SG-B067-BL1	-51.0	7617124	717233	067
	PDI-SG-B068-BL1	-40.5	7617815	716439	068
	PDI-SG-B069-BL1	-41.5	7617947	716029	069
	PDI-SG-B070-BL1	-64.5	7618343	714911	070
	PDI-SG-B071-BL1	-51.2	7618817	714064	071
	PDI-SG-B072-BL1	-73.2	7619068	712732	072
	PDI-SG-B073-BL1	-69.5	7619446	712180	073
	PDI-SG-B074-BL1	-68.2	7620102	710514	074
	PDI-SG-B075-BL1	-53.5	7620243	710456	075
	PDI-SG-B076-BL1	-52.1	7620930	709605	076
	PDI-SG-B077-BL1	-46.3	7622006	708148	077
	PDI-SG-B078-BL1	-47.9	7622419	708016	078
	PDI-SG-B079-BL1	-48.0	7623265	706949	079
	PDI-SG-B080-BL1	-46.2	7623978	706272	080
	PDI-SG-B081-BL1	-49.4	7624793	705691	081
	PDI-SG-B082-BL1	-44.5	7625828	705179	082
	PDI-SG-B083-BL1	-43.7	7626858	704403	083
	PDI-SG-B084-BL1	-43.3	7627238	704258	084
	PDI-SG-B085-BL1	-44.7	7627760	703449	085
	PDI-SG-B086-BL1	-51.5	7628649	702734	086
	PDI-SG-B087-BL1	-32.3	7630363	701971	087
	PDI-SG-B088-BL1	-53.3	7630434	701066	088
	PDI-SG-B089-BL1	-45.2	7631376	700488	089
	PDI-SG-B090-BL1	-48.3	7632011	699460	090
	PDI-SG-B091-BL1	-49.0	7632336	699365	091
	PDI-SG-B092-BL1	-47.6	7633517	698268	092
	PDI-SG-B093-BL1	-48.6	7634491	697451	093
	PDI-SG-B094-BL1	-40.7	7635287	696651	094
	PDI-SG-B095-BL1	-42.6	7635621	696816	095
	PDI-SG-B096-BL1	-70.3	7636681	696087	096
	PDI-SG-B097-BL1	-52.2	7637714	695215	097
	PDI-SG-B098-BL1	-50.7	7638542	695107	098
	PDI-SG-B099-BL1	-43.5	7639579	694249	099
	PDI-SG-B100-BL1	-38.1	7640197	693484	100
	PDI-SG-B101-BL1	-45.7	7640935	692176	101
	PDI-SG-B102-BL1	-43.5	7641324	691939	102
	PDI-SG-B103-BL1	-62.8	7642279	690634	103
	PDI-SG-B104-BL1	-52.5	7642860	690013	104
	PDI-SG-B105-BL1	-43.6	7643676	689022	105
	PDI-SG-B106-BL1	-54.9	7644487	688429	106
	PDI-SG-B107-BL1	-36.9	7645040	687776	107
	PDI-SG-B108-BL1	-39.4	7645069	687610	108
	PDI-SG-B109-BL1	-19.7	7616377	726091	109

**Table 4. Station Location Coordinates, Target Depth and Identification Scheme - Alternative 2 Locations**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B110-BL1	-17.2	7616271	726051	110
	PDI-SG-B111-BL1	-28.6	7616221	725647	111
	PDI-SG-B112-BL1	NA	7615737	725649	112
	PDI-SG-B113-BL1	-19.2	7615840	724957	113
	PDI-SG-B114-BL1	-13.3	7615578	724653	114
	PDI-SG-B115-BL1	NA	7615399	724417	115
	PDI-SG-B116-BL1	NA	7615382	724054	116
	PDI-SG-B117-BL1	NA	7615221	723824	117
	PDI-SG-B118-BL1	-35.0	7615623	723259	118
	PDI-SG-B119-BL1	-26.2	7615446	722963	119
	PDI-SG-B120-BL1	-26.0	7615363	722562	120
	PDI-SG-B121-BL1	-51.5	7615475	721934	121
	PDI-SG-B122-BL1	-56.2	7615504	721834	122
	PDI-SG-B123-BL1	NA	7615060	721348	123
	PDI-SG-B124-BL1	-12.4	7615386	721064	124
	PDI-SG-B125-BL1	-6.1	7615091	720665	125
	PDI-SG-B126-BL1	-18.4	7615200	720118	126
	PDI-SG-B127-BL1	-21.5	7615568	719957	127
	PDI-SG-B128-BL1	-18.6	7615664	719409	128
	PDI-SG-B129-BL1	-18.6	7615744	719333	129
	PDI-SG-B130-BL1	-27.6	7615736	718984	130
	PDI-SG-B131-BL1	-22.8	7615698	718370	131
	PDI-SG-B132-BL1	-24.0	7615760	718200	132
	PDI-SG-B133-BL1	-34.9	7616024	717834	133
	PDI-SG-B134-BL1	-30.8	7616096	717450	134
	PDI-SG-B135-BL1	-35.3	7616393	717155	135
	PDI-SG-B136-BL1	-18.9	7616260	716927	136
	PDI-SG-B137-BL1	-30.2	7616484	716613	137
	PDI-SG-B138-BL1	-27.8	7616621	716173	138
	PDI-SG-B139-BL1	NA	7616649	715759	139
	PDI-SG-B140-BL1	NA	7616784	715123	140
	PDI-SG-B141-BL1	-31.2	7617099	714940	141
	PDI-SG-B142-BL1	NA	7617111	714515	142
	PDI-SG-B143-BL1	-23.6	7617271	714445	143
	PDI-SG-B144-BL1	NA	7617345	713934	144
	PDI-SG-B145-BL1	NA	7617541	713645	145
	PDI-SG-B146-BL1	NA	7617569	713431	146
	PDI-SG-B147-BL1	NA	7617754	713228	147
	PDI-SG-B148-BL1	NA	7617938	712904	148
	PDI-SG-B149-BL1	NA	7618118	712556	149
	PDI-SG-B150-BL1	-8.3	7618399	712140	150
	PDI-SG-B151-BL1	NA	7618424	711813	151
	PDI-SG-B152-BL1	NA	7618697	711320	152
	PDI-SG-B153-BL1	-26.0	7619007	711080	153
	PDI-SG-B154-BL1	-13.3	7619164	710754	154
	PDI-SG-B155-BL1	-30.7	7619385	710529	155
	PDI-SG-B156-BL1	-30.9	7619534	710300	156
	PDI-SG-B157-BL1	-25.7	7619724	710070	157
	PDI-SG-B158-BL1	-20.8	7619892	709838	158
	PDI-SG-B159-BL1	NA	7620043	709540	159
	PDI-SG-B160-BL1	NA	7620278	709210	160
	PDI-SG-B161-BL1	-34.3	7620564	708987	161
	PDI-SG-B162-BL1	-16.4	7620842	708501	162
	PDI-SG-B163-BL1	NA	7620934	708388	163
	PDI-SG-B164-BL1	-8.3	7621336	707959	164

**Table 4. Station Location Coordinates, Target Depth and Identification Scheme - Alternative 2 Locations**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B165-BL1	-11.8	7621609	707635	165
	PDI-SG-B166-BL1	NA	7621852	707376	166
	PDI-SG-B167-BL1	NA	7622005	707081	167
	PDI-SG-B168-BL1	-17.8	7622142	707084	168
	PDI-SG-B169-BL1	NA	7622382	706381	169
	PDI-SG-B170-BL1	-8.2	7622742	706366	170
	PDI-SG-B171-BL1	-40.1	7623056	706371	171
	PDI-SG-B172-BL1	NA	7623233	706008	172
	PDI-SG-B173-BL1	-8.3	7623629	705877	173
	PDI-SG-B174-BL1	NA	7623930	705616	174
	PDI-SG-B175-BL1	NA	7624270	705419	175
	PDI-SG-B176-BL1	NA	7624645	705214	176
	PDI-SG-B177-BL1	-12.1	7625041	705063	177
	PDI-SG-B178-BL1	NA	7625242	704873	178
	PDI-SG-B179-BL1	-14.9	7625469	704820	179
	PDI-SG-B180-BL1	-7.4	7625698	704652	180
	PDI-SG-B181-BL1	NA	7626153	704203	181
	PDI-SG-B182-BL1	-30.1	7626400	704222	182
	PDI-SG-B183-BL1	NA	7626497	703793	183
	PDI-SG-B184-BL1	-31.2	7626894	703712	184
	PDI-SG-B185-BL1	NA	7626762	703468	185
	PDI-SG-B186-BL1	NA	7627197	703039	186
	PDI-SG-B187-BL1	-9.5	7627458	702988	187
	PDI-SG-B188-BL1	-7.1	7627772	702610	188
	PDI-SG-B189-BL1	-15.2	7627838	702600	189
	PDI-SG-B190-BL1	-17.2	7628147	702267	190
	PDI-SG-B191-BL1	NA	7628341	701919	191
	PDI-SG-B192-BL1	NA	7628508	701512	192
	PDI-SG-B193-BL1	-7.9	7628461	701096	193
	PDI-SG-B194-BL1	-27.3	7629020	701157	194
	PDI-SG-B195-BL1	-13.9	7628637	700563	195
	PDI-SG-B196-BL1	-15.4	7628987	700193	196
	PDI-SG-B197-BL1	-7.2	7629535	700190	197
	PDI-SG-B198-BL1	-17.4	7629766	700259	198
	PDI-SG-B199-BL1	-34.5	7630182	699945	199
	PDI-SG-B200-BL1	-7.2	7630229	699717	200
	PDI-SG-B201-BL1	-22.6	7630713	699334	201
	PDI-SG-B202-BL1	NA	7630660	699092	202
	PDI-SG-B203-BL1	-20.7	7630999	699062	203
	PDI-SG-B204-BL1	-14.4	7631397	698499	204
	PDI-SG-B205-BL1	NA	7631295	698075	205
	PDI-SG-B206-BL1	-13.1	7631722	697897	206
	PDI-SG-B207-BL1	-7.6	7632184	697782	207
	PDI-SG-B208-BL1	-9.0	7632311	697578	208
	PDI-SG-B209-BL1	NA	7632702	697028	209
	PDI-SG-B210-BL1	NA	7632917	696924	210
	PDI-SG-B211-BL1	-17.5	7633236	696937	211
	PDI-SG-B212-BL1	-21.8	7633592	696749	212
	PDI-SG-B213-BL1	NA	7633926	696492	213
	PDI-SG-B214-BL1	NA	7634314	696255	214
	PDI-SG-B215-BL1	-14.2	7634608	696084	215
	PDI-SG-B216-BL1	NA	7634716	696024	216
	PDI-SG-B217-BL1	-17.0	7635243	695793	217
	PDI-SG-B218-BL1	-20.1	7635543	695681	218
	PDI-SG-B219-BL1	-17.2	7635639	695548	219

**Table 4. Station Location Coordinates, Target Depth and Identification Scheme - Alternative 2 Locations**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B220-BL1	-11.9	7636108	695543	220
	PDI-SG-B221-BL1	-20.5	7636294	695195	221
	PDI-SG-B222-BL1	-18.3	7636525	694990	222
	PDI-SG-B223-BL1	NA	7636797	694818	223
	PDI-SG-B224-BL1	-31.3	7637304	694866	224
	PDI-SG-B225-BL1	-30.5	7637980	694375	225
	PDI-SG-B226-BL1	-31.5	7638291	694117	226
	PDI-SG-B227-BL1	NA	7637200	694055	227
	PDI-SG-B228-BL1	-30.9	7638407	693996	228
	PDI-SG-B229-BL1	-36.9	7638754	693684	229
	PDI-SG-B230-BL1	-35.9	7638917	693531	230
	PDI-SG-B231-BL1	-36.0	7639043	693394	231
	PDI-SG-B232-BL1	-37.9	7639263	693205	232
	PDI-SG-B233-BL1	NA	7639510	692893	233
	PDI-SG-B234-BL1	-14.6	7639850	692508	234
	PDI-SG-B235-BL1	-28.0	7639952	692418	235
	PDI-SG-B236-BL1	-28.0	7640259	692030	236
	PDI-SG-B237-BL1	-22.0	7640382	691855	237
	PDI-SG-B238-BL1	-22.0	7640650	691523	238
	PDI-SG-B239-BL1	-24.1	7640940	691133	239
	PDI-SG-B240-BL1	-21.1	7640908	690928	240
	PDI-SG-B241-BL1	-24.0	7641396	690660	241
	PDI-SG-B242-BL1	-7.4	7641526	690408	242
	PDI-SG-B243-BL1	-19.6	7641720	690295	243
	PDI-SG-B244-BL1	-19.9	7642020	689921	244
	PDI-SG-B245-BL1	-36.6	7642208	689751	245
	PDI-SG-B246-BL1	NA	7642506	689336	246
	PDI-SG-B247-BL1	NA	7642818	689089	247
	PDI-SG-B248-BL1	-8.6	7643081	688894	248
	PDI-SG-B249-BL1	-5.1	7643221	688747	249
	PDI-SG-B250-BL1	NA	7643478	688422	250
	PDI-SG-B251-BL1	-9.6	7643738	688201	251
	PDI-SG-B252-BL1	-16.7	7644188	687835	252
	PDI-SG-B253-BL1	-25.2	7644372	687654	253
	PDI-SG-B254-BL1	-40.8	7644703	687537	254
	PDI-SG-B255-BL1	-39.2	7644856	687437	255
	PDI-SG-B256-BL1	-47.4	7645012	687197	256
	PDI-SG-B257-BL1	-59.8	7645391	686932	257
	PDI-SG-B258-BL1	-61.3	7645586	686604	258
	PDI-SG-B259-BL1	-26.3	7617834	725168	259
	PDI-SG-B260-BL1	-41.7	7617479	725278	260
	PDI-SG-B261-BL1	-44.5	7617626	724935	261
	PDI-SG-B262-BL1	-50.0	7617515	724839	262
	PDI-SG-B263-BL1	-3.8	7617612	724560	263
	PDI-SG-B264-BL1	-28.3	7617346	724177	264
	PDI-SG-B265-BL1	-34.2	7616801	724053	265
	PDI-SG-B266-BL1	NA	7617223	723613	266
	PDI-SG-B267-BL1	-34.1	7616719	723278	267
	PDI-SG-B268-BL1	-38.4	7616728	722964	268
	PDI-SG-B269-BL1	-40.2	7616480	722718	269
	PDI-SG-B270-BL1	NA	7616910	722288	270
	PDI-SG-B271-BL1	-42.0	7616457	721924	271
	PDI-SG-B272-BL1	-45.0	7616314	721763	272
	PDI-SG-B273-BL1	-40.9	7616448	721570	273
	PDI-SG-B274-BL1	-38.0	7616420	721093	274

**Table 4. Station Location Coordinates, Target Depth and Identification Scheme - Alternative 2 Locations**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B275-BL1	-39.1	7616677	720945	275
	PDI-SG-B276-BL1	NA	7616881	720497	276
	PDI-SG-B277-BL1	-29.6	7616836	720076	277
	PDI-SG-B278-BL1	-40.6	7616792	719820	278
	PDI-SG-B279-BL1	-40.8	7616831	719591	279
	PDI-SG-B280-BL1	-33.0	7616925	719234	280
	PDI-SG-B281-BL1	-29.1	7617142	718605	281
	PDI-SG-B282-BL1	-9.0	7617284	718490	282
	PDI-SG-B283-BL1	-27.2	7617362	718050	283
	PDI-SG-B284-BL1	-44.2	7617299	717859	284
	PDI-SG-B285-BL1	NA	7617710	717637	285
	PDI-SG-B286-BL1	-38.7	7617738	716994	286
	PDI-SG-B287-BL1	-31.3	7617839	716865	287
	PDI-SG-B288-BL1	-33.6	7617922	716573	288
	PDI-SG-B289-BL1	-26.0	7618106	716309	289
	PDI-SG-B290-BL1	NA	7618315	716112	290
	PDI-SG-B291-BL1	-24.4	7618459	715559	291
	PDI-SG-B292-BL1	-25.2	7618490	715498	292
	PDI-SG-B293-BL1	-32.7	7618689	714972	293
	PDI-SG-B294-BL1	-30.6	7618808	714733	294
	PDI-SG-B295-BL1	-35.8	7618975	714490	295
	PDI-SG-B296-BL1	-28.6	7619024	714069	296
	PDI-SG-B297-BL1	-12.8	7619364	713782	297
	PDI-SG-B298-BL1	-40.8	7619366	713577	298
	PDI-SG-B299-BL1	-42.3	7619519	712938	299
	PDI-SG-B300-BL1	-18.5	7619685	712890	300
	PDI-SG-B301-BL1	-40.0	7619807	712334	301
	PDI-SG-B302-BL1	-38.9	7619955	712080	302
	PDI-SG-B303-BL1	-39.3	7620035	711942	303
	PDI-SG-B304-BL1	-41.9	7620151	711618	304
	PDI-SG-B305-BL1	-34.9	7620343	711375	305
	PDI-SG-B306-BL1	-34.1	7620599	710908	306
	PDI-SG-B307-BL1	-10.9	7620891	710635	307
	PDI-SG-B308-BL1	-19.6	7620947	710440	308
	PDI-SG-B309-BL1	-9.3	7621165	710157	309
	PDI-SG-B310-BL1	NA	7621274	709917	310
	PDI-SG-B311-BL1	-32.4	7621419	709478	311
	PDI-SG-B312-BL1	-33.7	7621581	709198	312
	PDI-SG-B313-BL1	NA	7622096	708966	313
	PDI-SG-B314-BL1	NA	7622153	708843	314
	PDI-SG-B315-BL1	-38.2	7622270	708386	315
	PDI-SG-B316-BL1	NA	7622549	708336	316
	PDI-SG-B317-BL1	-13.2	7622700	708040	317
	PDI-SG-B318-BL1	-42.9	7622936	707486	318
	PDI-SG-B319-BL1	-46.1	7623185	707261	319
	PDI-SG-B320-BL1	-10.8	7623647	707207	320
	PDI-SG-B321-BL1	-29.2	7623720	707088	321
	PDI-SG-B322-BL1	-54.3	7623855	706585	322
	PDI-SG-B323-BL1	-42.7	7624262	706597	323
	PDI-SG-B324-BL1	-44.1	7624430	706440	324
	PDI-SG-B325-BL1	-31.4	7624942	706234	325
	PDI-SG-B326-BL1	-43.7	7625184	705962	326
	PDI-SG-B327-BL1	-43.7	7625222	705825	327
	PDI-SG-B328-BL1	-15.5	7625780	705954	328
	PDI-SG-B329-BL1	-10.3	7626116	705901	329

**Table 4. Station Location Coordinates, Target Depth and Identification Scheme - Alternative 2 Locations**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B330-BL1	-43.5	7626239	705150	330
	PDI-SG-B331-BL1	-44.4	7626665	705117	331
	PDI-SG-B332-BL1	-21.8	7626908	705162	332
	PDI-SG-B333-BL1	-48.3	7627040	704569	333
	PDI-SG-B334-BL1	NA	7627719	704556	334
	PDI-SG-B335-BL1	-9.5	7628000	704316	335
	PDI-SG-B336-BL1	NA	7628117	704266	336
	PDI-SG-B337-BL1	-30.5	7628325	704014	337
	PDI-SG-B338-BL1	-25.6	7628703	703697	338
	PDI-SG-B339-BL1	-44.3	7628854	703323	339
	PDI-SG-B340-BL1	-36.0	7629233	703008	340
	PDI-SG-B341-BL1	-11.3	7629574	703243	341
	PDI-SG-B342-BL1	-45.5	7629458	702531	342
	PDI-SG-B343-BL1	-27.5	7630134	702348	343
	PDI-SG-B344-BL1	-28.1	7630283	702218	344
	PDI-SG-B345-BL1	-9.2	7630521	702212	345
	PDI-SG-B346-BL1	-29.0	7630898	701858	346
	PDI-SG-B347-BL1	-24.8	7631224	701766	347
	PDI-SG-B348-BL1	-10.6	7631639	701630	348
	PDI-SG-B349-BL1	-34.2	7631695	701522	349
	PDI-SG-B350-BL1	-35.9	7632245	701501	350
	PDI-SG-B351-BL1	NA	7631624	700456	351
	PDI-SG-B352-BL1	-43.9	7631844	700238	352
	PDI-SG-B353-BL1	-43.8	7632185	699799	353
	PDI-SG-B354-BL1	-41.1	7632426	699681	354
	PDI-SG-B355-BL1	-36.6	7632801	699446	355
	PDI-SG-B356-BL1	-42.2	7633024	699193	356
	PDI-SG-B357-BL1	-39.5	7633193	699058	357
	PDI-SG-B358-BL1	-41.9	7633438	698814	358
	PDI-SG-B359-BL1	-39.2	7633644	698627	359
	PDI-SG-B360-BL1	-2.8	7634000	698636	360
	PDI-SG-B361-BL1	-35.1	7634275	698204	361
	PDI-SG-B362-BL1	-35.0	7634402	698113	362
	PDI-SG-B363-BL1	-8.6	7634737	697981	363
	PDI-SG-B364-BL1	-35.6	7634920	697663	364
	PDI-SG-B365-BL1	-31.7	7635238	697474	365
	PDI-SG-B366-BL1	-19.2	7635586	697287	366
	PDI-SG-B367-BL1	-16.5	7636013	697017	367
	PDI-SG-B368-BL1	-31.4	7636077	696906	368
	PDI-SG-B369-BL1	-23.3	7636485	696713	369
	PDI-SG-B370-BL1	-19.9	7636756	696503	370
	PDI-SG-B371-BL1	-19.4	7637073	696317	371
	PDI-SG-B372-BL1	NA	7637471	696208	372
	PDI-SG-B373-BL1	-15.7	7637569	696069	373
	PDI-SG-B374-BL1	-18.9	7638074	695716	374
	PDI-SG-B375-BL1	-30.8	7638081	695642	375
	PDI-SG-B376-BL1	-18.1	7638385	695529	376
	PDI-SG-B377-BL1	NA	7638997	695323	377
	PDI-SG-B378-BL1	NA	7639061	695347	378
	PDI-SG-B379-BL1	-16.5	7639467	694988	379
	PDI-SG-B380-BL1	-36.1	7639893	694441	380
	PDI-SG-B381-BL1	-36.6	7639953	694273	381
	PDI-SG-B382-BL1	-41.0	7640290	693666	382
	PDI-SG-B383-BL1	-40.0	7640305	693661	383
	PDI-SG-B384-BL1	-16.6	7640684	693132	384

**Table 4. Station Location Coordinates, Target Depth and Identification Scheme - Alternative 2 Locations**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sample Type	Sample ID	Mudline Elevation (CRD Feet) <sup>a</sup>	Proposed Location Coordinates (NAD83 (2011); Intl Feet) <sup>b</sup>		Sequential Station Count
			Easting	Northing	
Stratified random Site Samples	PDI-SG-B385-BL1	-24.2	7640800	692940	385
	PDI-SG-B386-BL1	-20.7	7641068	692640	386
	PDI-SG-B387-BL1	-28.7	7641092	692536	387
	PDI-SG-B388-BL1	-12.3	7641441	692103	388
	PDI-SG-B389-BL1	-28.6	7641709	691750	389
	PDI-SG-B390-BL1	-9.9	7641970	691532	390
	PDI-SG-B391-BL1	-31.8	7642120	691217	391
	PDI-SG-B392-BL1	-35.0	7642264	691011	392
	PDI-SG-B393-BL1	-20.1	7642588	690697	393
	PDI-SG-B394-BL1	-17.2	7642683	690604	394
	PDI-SG-B395-BL1	-29.9	7642858	690352	395
	PDI-SG-B396-BL1	-9.0	7643193	690166	396
	PDI-SG-B397-BL1	-29.5	7643400	689859	397
	PDI-SG-B398-BL1	-31.7	7643770	689619	398
	PDI-SG-B399-BL1	-13.5	7644077	689411	399
	PDI-SG-B400-BL1	-36.4	7644348	689085	400
	PDI-SG-B401-BL1	-46.7	7644447	688992	401
	PDI-SG-B402-BL1	-22.9	7644745	688763	402
	PDI-SG-B403-BL1	-20.1	7644938	688358	403
	PDI-SG-B404-BL1	-31.8	7645198	687926	404
	PDI-SG-B405-BL1	-21.8	7645387	687635	405
	PDI-SG-B406-BL1	-32.5	7645401	687558	406
	PDI-SG-B407-BL1	-63.4	7645537	687000	407
	PDI-SG-B408-BL1	-53.3	7645916	686771	408
	PDI-SG-B409-BL1	-10.3	7636745	698789	409
	PDI-SG-B410-BL1	-17.9	7636516	699206	410
	PDI-SG-B411-BL1	-19.8	7636438	699265	411
	PDI-SG-B412-BL1	NA	7635673	699247	412
	PDI-SG-B413-BL1	-24.6	7635767	699819	413
	PDI-SG-B414-BL1	-25.2	7635575	699722	414
	PDI-SG-B415-BL1	-4.2	7635272	700312	415
	PDI-SG-B416-BL1	-32.9	7634827	700112	416
	PDI-SG-B417-BL1	-31.1	7634643	700449	417
	PDI-SG-B418-BL1	-32.8	7634369	700408	418
	PDI-SG-B419-BL1	-7.8	7634465	701068	419
	PDI-SG-B420-BL1	NA	7634059	701261	420
	PDI-SG-B421-BL1	-32.9	7633509	701342	421
	PDI-SG-B422-BL1	-33.5	7633413	701362	422
	PDI-SG-B423-BL1	-24.7	7632691	701777	423
	PDI-SG-B424-BL1	NA	7632934	701251	424
	PDI-SG-B425-BL1	-32.4	7632459	701522	425
	PDI-SG-B426-BL1	-40.0	7632028	701164	426
	PDI-SG-B427-BL1	-38.7	7632337	700386	427
	PDI-SG-B428-BL1	-56.5	7631718	700785	428

**General Notes:**

1. All surface sediment samples have a target depth of 30 cm.
2. Conversion From CRD to NAVD88: Elevation (CRD) +5.38 ≈ NAVD88 (Geoid12b)
3. NA = not available

**Footnotes:**

- a) Vertical Datum: CRD (Columbia River Datum; Feet); based on 2009 NOAA bathymetry  
 b) Horizontal Projection: NAD83 (2011), State Plane Coordinate System (SPCS) Oregon North Zone (Intl Feet)

**Table 5. Field Quality Control Sample Requirements**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

QA/QC Sample Type	Frequency
Temperature Blanks	1 per cooler
Field Duplicates	5 percent
Field Equipment Rinsate Blanks	5 percent or 1 per week per equipment

**Acronyms:**

QA/QC = quality assurance/quality control

**Table 6. Summary of Estimated Field Quality Control Samples**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Surface Sediment Sample Type	Number of Project Samples	Estimated # of Field Weeks	Field Duplicates	Field Equipment Rinsate Blanks
Stratified Random Site Samples	428	8.6	22	86
SMA Targeted Site Samples	178	3.6	9	36
Co-located Grabs at In-water Core Stations	60	1.2	3	12
Downtown/Upriver Reaches	60	2.0	3	20
<b>Total Count</b>	<b>726</b>	<b>15.3</b>	<b>37</b>	<b>153</b>

**General Notes:**

1. Estimated # of field weeks for one vessel; we plan to have 2 vessels in the field.

**Table 7. Analyte List**

Portland Harbor PDI Surface Sediment FSP  
Portland, OR

Media	Location Count	Analyte List	
		Parameter	Method
Surface Sediment Stratified Random	428 - within Site; 60 - D/U Reach	Aldrin	8081B
		Arsenic	6020B
		Atterberg Limits	ASTM D4318
		BEHP	8270C
		Cadmium	6020B
		Chlordanes	8081B
		Copper	6020B
		DDx	8081B
		DDD	8081B
		DDE	8081B
		DDT	8081B
		Dieldrin	8081B
		Lindane	8081B
		Lead	6020B
		Mercury	7471A
		PCB congeners	1668
		PAHs	8270D SIM
		cPAHs (BaP eq)	8270D SIM
		1,2,3,4,7,8-HxCDF	1613B
		1,2,3,7,8-PeCDD	1613B
		2,3,4,7,8-PeCDF	1613B
		2,3,7,8-TCDF	1613B
		2,3,7,8-TCDD	1613B
		PCDD/Fs	1613B
		TPH-Diesel	NWTPH-Dx
		Tributyltin	Organotin
		Zinc	6020B
		TOC	Plumb 1981/ EPA 9060
		Grain Size	ASTM D7928 / D6913
Additional Surface Sediment - SMA	178 - within Site	DDx	8081B
		PCB congeners	1668
		PAHs	8270D SIM
		PCDD/Fs	1613B
		TOC	Plumb 1981/ EPA 9060
		Grain Size	ASTM D7928 / D6913
Additional Surface Sediment - In- water Core Location Grab	60 - within Site	DDx	8081B
		PCB congeners	1668
		PAHs	8270D SIM
		PCDD/Fs	1613B
		TOC	Plumb 1981/ EPA 9060
		Grain Size	ASTM D7928 / D6913

**Abbreviations:**

BL - baseline; DDx - sum of dichlorodiphenyltrichloroethane and its derivatives; PAHs - polycyclic aromatic hydrocarbon; PCBs - polychlorinated biphenyls; PCDD/Fs - polychlorinated dibenzo-p-dioxins and furans; PDI - Pre-remedial Design Investigation. PSEP - Puget Sound Estuary Protocol; TOC - total organic carbon; D/U - Downtown/Upriver Reach; SS - surface grab

**Table 8. Sample Containers, Preservation, Holding Times, and Sample Volume**

Portland Harbor PDI Surface Sediment FSP

Portland, OR

Sediment Analysis	Container		Preservation	Holding Time	Minimum Sample Size (wet weight grams)
	Type	Size			
PCBs	WMG	8 oz	Refrigerate, 0 to 6°C Deep Frozen (-20°C)	1 year, 1 year	100
PCDD/PCDFs	WMG	8 oz	Refrigerate, 0 to 6°C Deep Frozen (-20°C)	1 year, 1 year <sup>a</sup>	100
Pesticides	WMG	8 oz	Refrigerate, 0 to 6°C Deep Frozen (-20°C)	14 days, 1 year	100
SVOCs	WMG	8 oz	Refrigerate, 0 to 6°C Deep Frozen (-20°C)	14 days, 1 year	100
VOCs	G (no headspace)	8 oz	Refrigerate, 4 ± 2°C	14 days	50
Herbicides	WMG	8 oz	Refrigerate, 0 to 6°C Deep Frozen (-20°C)	14 days, 1 year	100
Metals	G or P	8 oz	Refrigerate, 0 to 6°C Deep Frozen (-20°C)	6 months, 2 years	50
Mercury	WMG	8 oz	Refrigerate, 0 to 6°C Deep Frozen (-20°C)	28 days, 28 days	50
Tributyltin	WMG	8 oz	Refrigerate, 0 to 6°C Deep Frozen (-20°C)	14 days, 1 year	100
Grain size	G or P	16 oz	Refrigerate, 4 ± 2°C	6 months	100 to 150
Total organic carbon	WMG	8 oz	Refrigerate, 0 to 6°C Deep Frozen (-20°C)	14 days, 1 year	25
Total solids	G or P	8 oz	Refrigerate, 0 to 6°C Deep Frozen (-20°C)	14 days, 6 months	50

**General Notes:**

1. Refrigerate preservation times consistent with PSEP protocols for Washington State.
2. Frozen preservation times provided from PSEP 1996.
3. Method detection limits presented in the project QAPP.

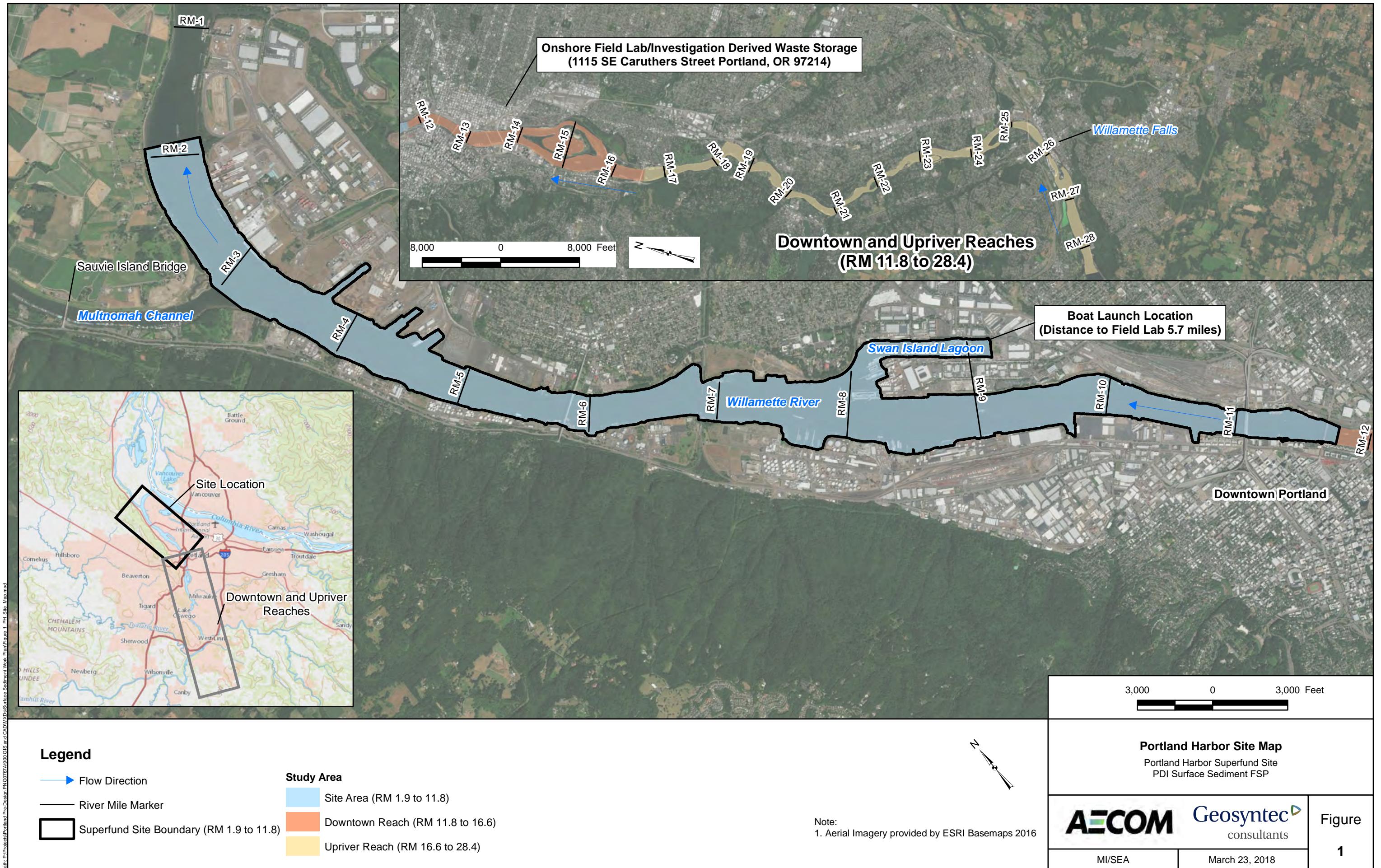
**Footnotes:**

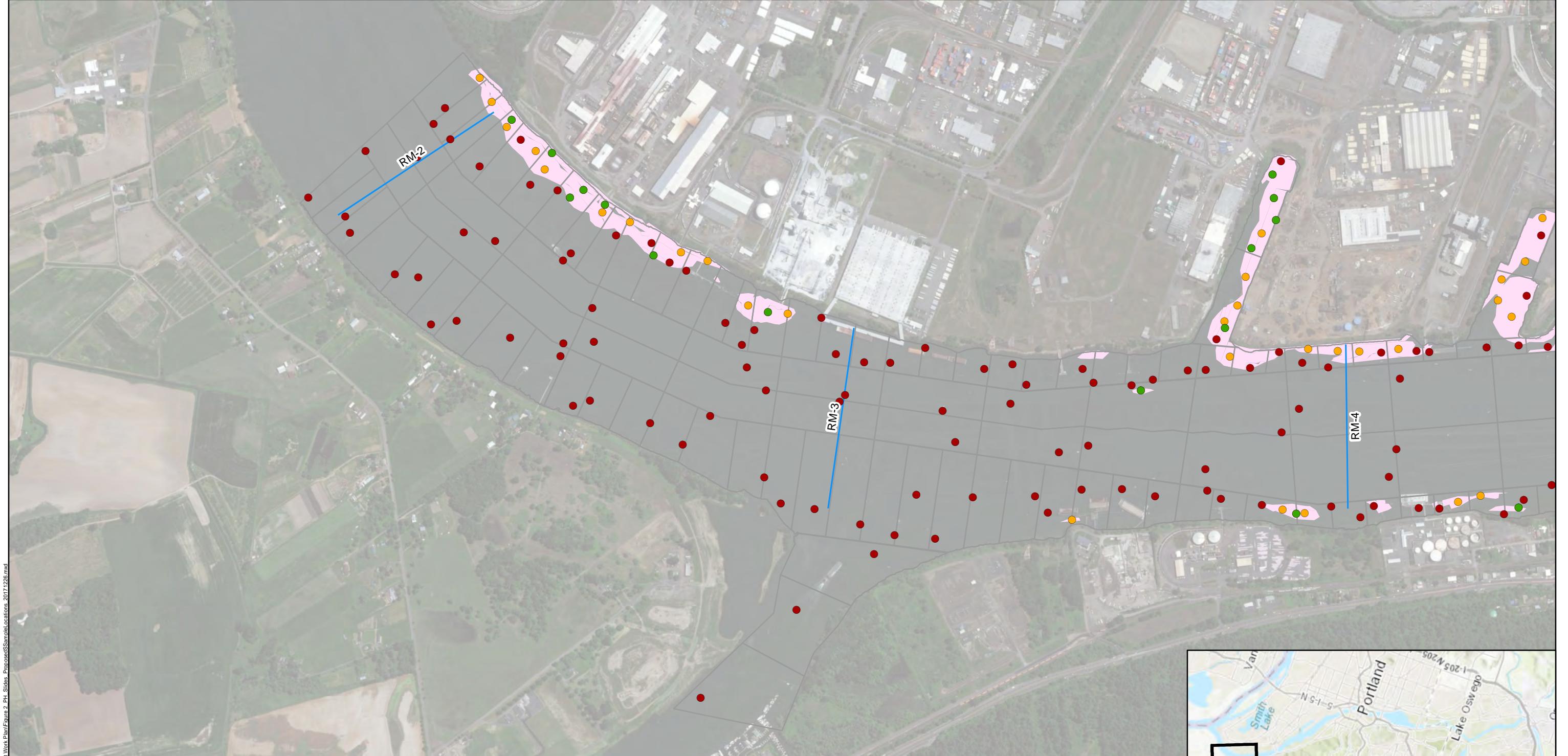
a) stored in darkness

G - glass; P - plastic; WMG - wide mouth glass

## **FIGURES**

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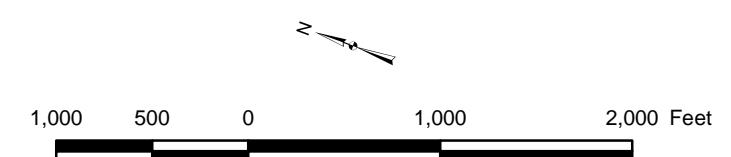


### Legend

- Stratified Random Samples (n = 428)
- Randomized Sample Grid Cells
- Additional SMA Samples (n = 178)
- Capped Area (Existing)
- Surface Grab at Co-located Core Location (n = 60)
- Alternative F Mod SMA Footprint
- River Mile Marker

### Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. 5 grabs were removed from the RM 11E vicinity and will be redistributed in the site (TBD).
4. n - sample count, RM - river mile. SMA - Sediment Management Area.
5. SMA surface sediment grab samples may need to be revisited based on redistribution of cores to optimize coverage in the SMAs.



**Proposed Surface Sediment Sampling Locations - RM 1.9 to 4**

Portland Harbor Superfund Site  
PDI Surface Sediment FSP

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consultants

Figure

2a

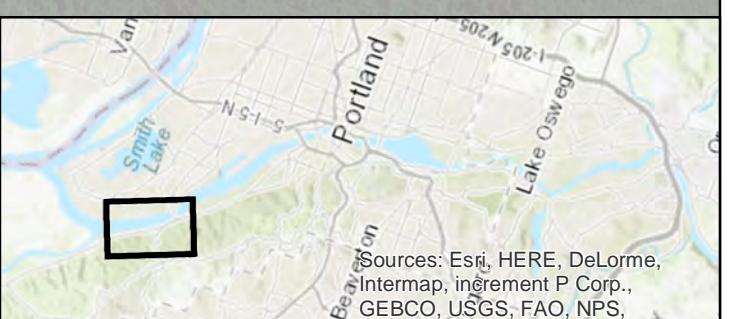
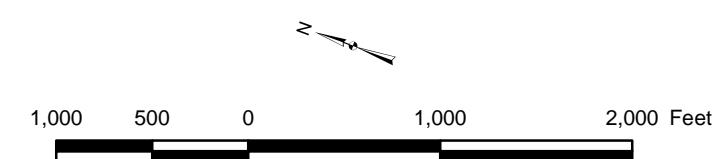


### Legend

- Stratified Random Samples (n = 428)
- Randomized Sample Grid Cells
- Additional SMA Samples (n = 178)
- Capped Area (Existing)
- Surface Grab at Co-located Core Location (n = 60)
- Alternative F Mod SMA Footprint
- River Mile Marker

### Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. 5 grabs were removed from the RM 11E vicinity and will be redistributed in the site (TBD).
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5. SMA surface sediment grab samples may need to be revisited based on redistribution of cores to optimize coverage in the SMAs.



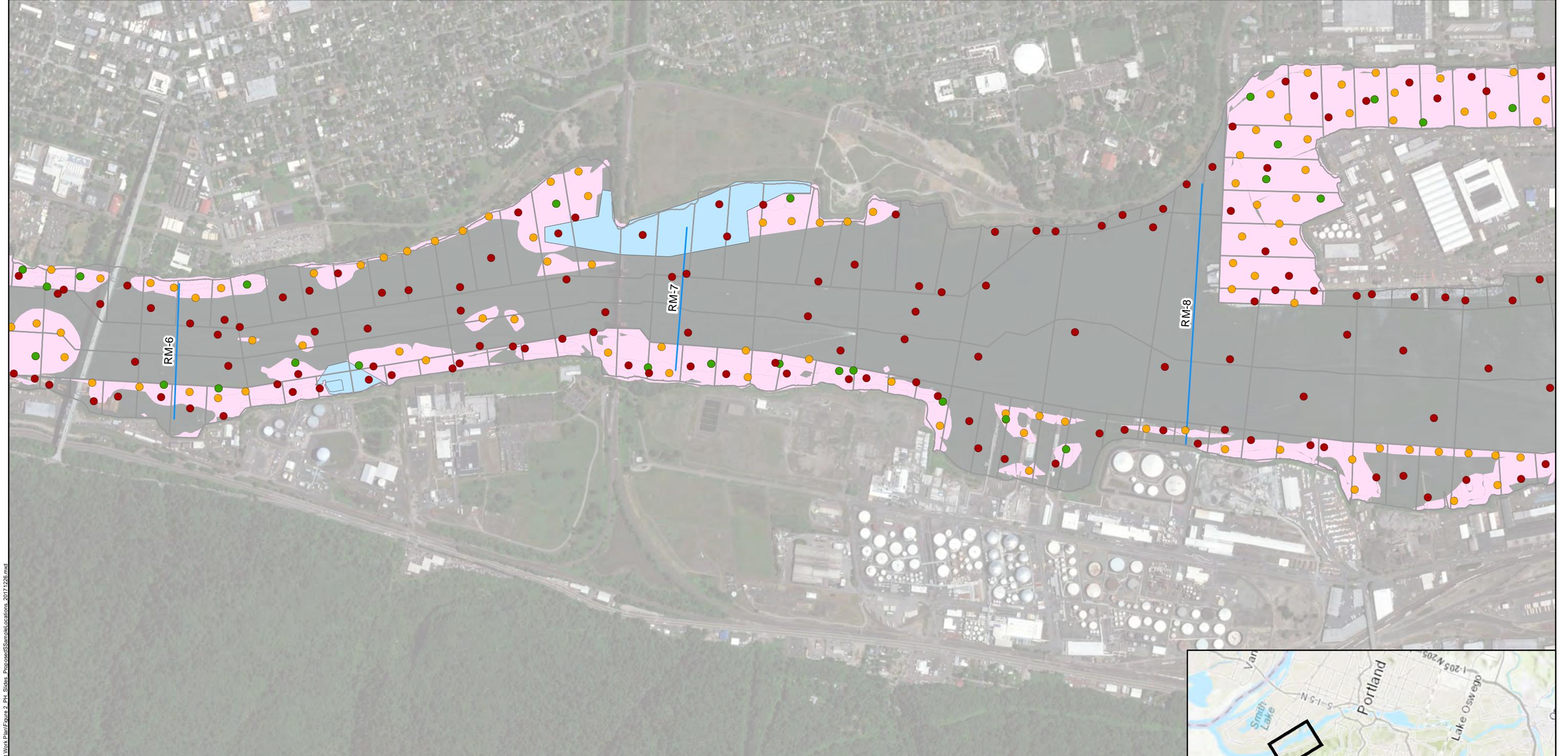
**Proposed Surface Sediment Sampling Locations - RM 4 to 6**

Portland Harbor Superfund Site  
PDI Surface Sediment FSP

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Figure

**2b**



#### Legend

- Stratified Random Samples (n = 428)
- Randomized Sample Grid Cells
- Additional SMA Samples (n = 178)
- Capped Area (Existing)
- Surface Grab at Co-located Core Location (n = 60)
- Alternative F Mod SMA Footprint
- River Mile Marker

#### Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. 5 grabs were removed from the RM 11E vicinity and will be redistributed in the site (TBD).
4. n - sample count, RM - river mile. SMA - Sediment Management Area.
5. SMA surface sediment grab samples may need to be revisited based on redistribution of cores to optimize coverage in the SMAs.

1,000 500 0 1,000 2,000 Feet

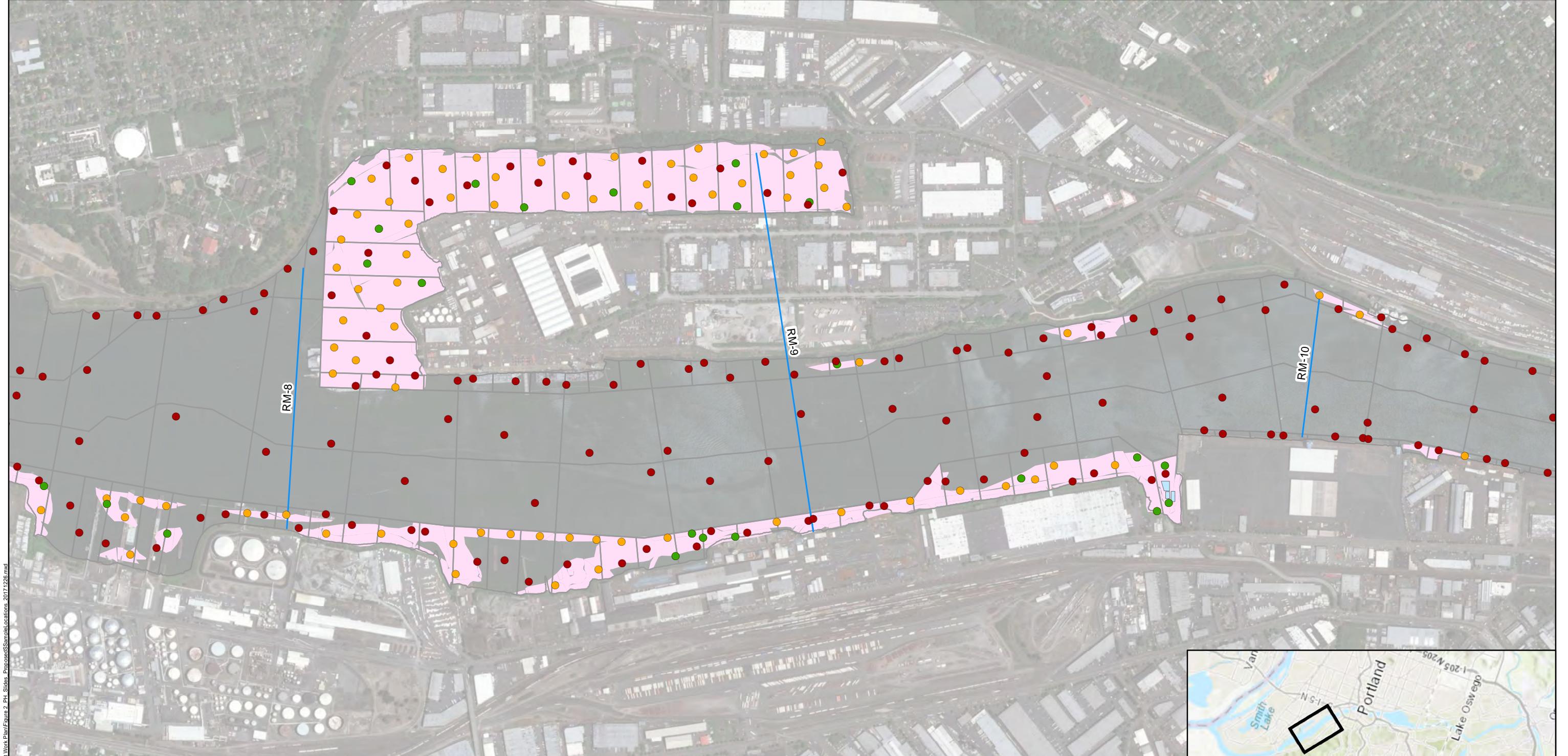


**Proposed Surface Sediment Sampling Locations - RM 6 to 8**

Portland Harbor Superfund Site  
PDI Surface Sediment FSP

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Figure  
**2c**



#### Legend

- Stratified Random Samples (n = 428)
- Randomized Sample Grid Cells
- Additional SMA Samples (n = 178)
- Capped Area (Existing)
- Surface Grab at Co-located Core Location (n = 60)
- Alternative F Mod SMA Footprint
- River Mile Marker

#### Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. 5 grabs were removed from the RM 11E vicinity and will be redistributed in the site (TBD).
4. n - sample count, RM - river mile. SMA - Sediment Management Area.
5. SMA surface sediment grab samples may need to be revisited based on redistribution of cores to optimize coverage in the SMAs.

1,000 500 0 1,000 2,000 Feet



**Proposed Surface Sediment Sampling Locations - RM 8 to 10**

Portland Harbor Superfund Site  
PDI Surface Sediment FSP

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Figure

2d



#### Legend

- Stratified Random Samples (n = 428)
- Randomized Sample Grid Cells
- Additional SMA Samples (n = 178)
- Capped Area (Existing)
- Surface Grab at Co-located Core Location (n = 60)
- Alternative F Mod SMA Footprint
- River Mile Marker

#### Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. 5 grabs were removed from the RM 11E vicinity and will be redistributed in the site (TBD).
4. n - sample count, RM - river mile. SMA - Sediment Management Area.
5. SMA surface sediment grab samples may need to be revisited based on redistribution of cores to optimize coverage in the SMAs.

1,000 500 0 1,000 2,000 Feet

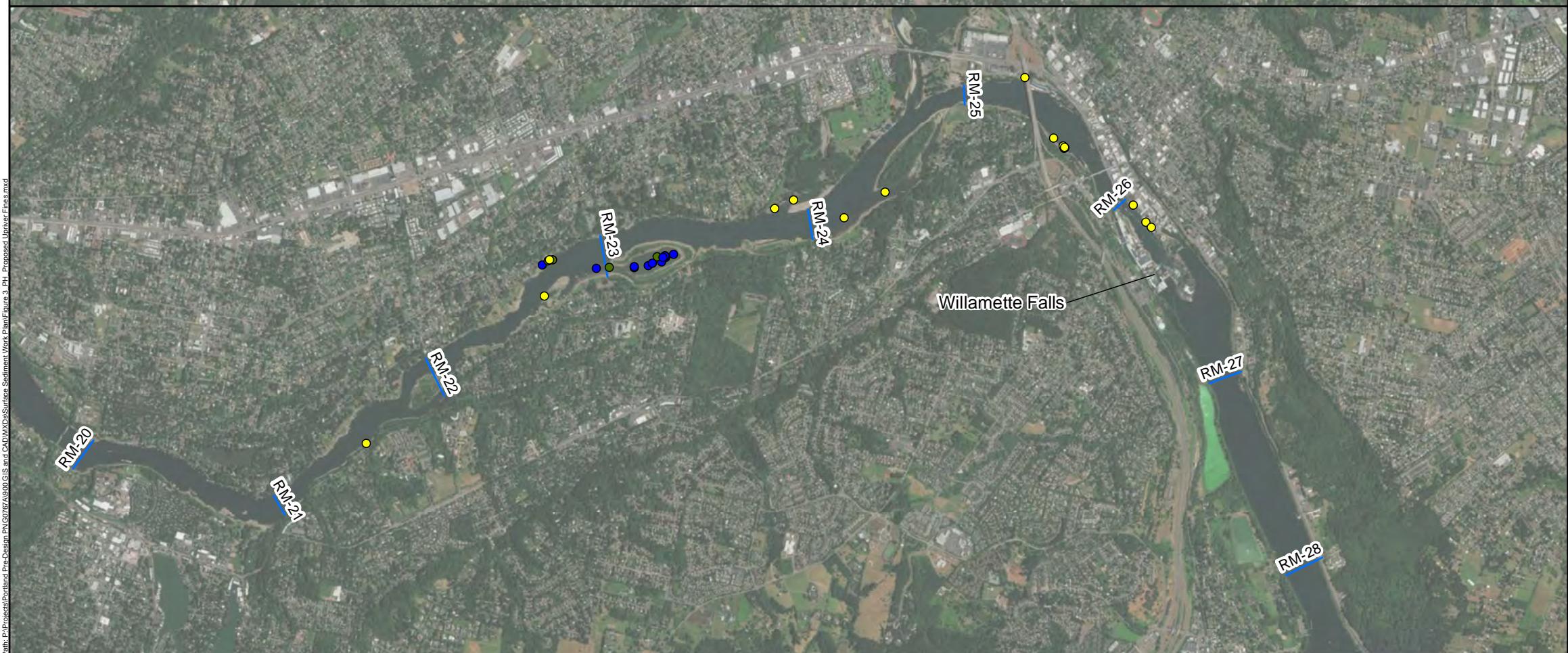
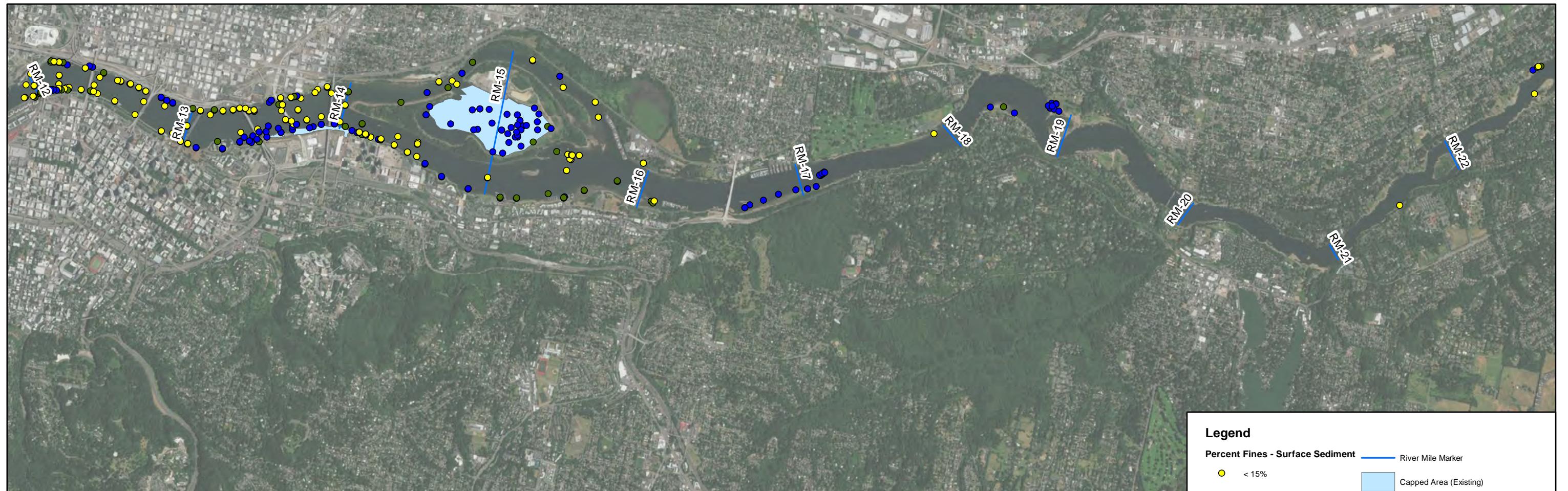


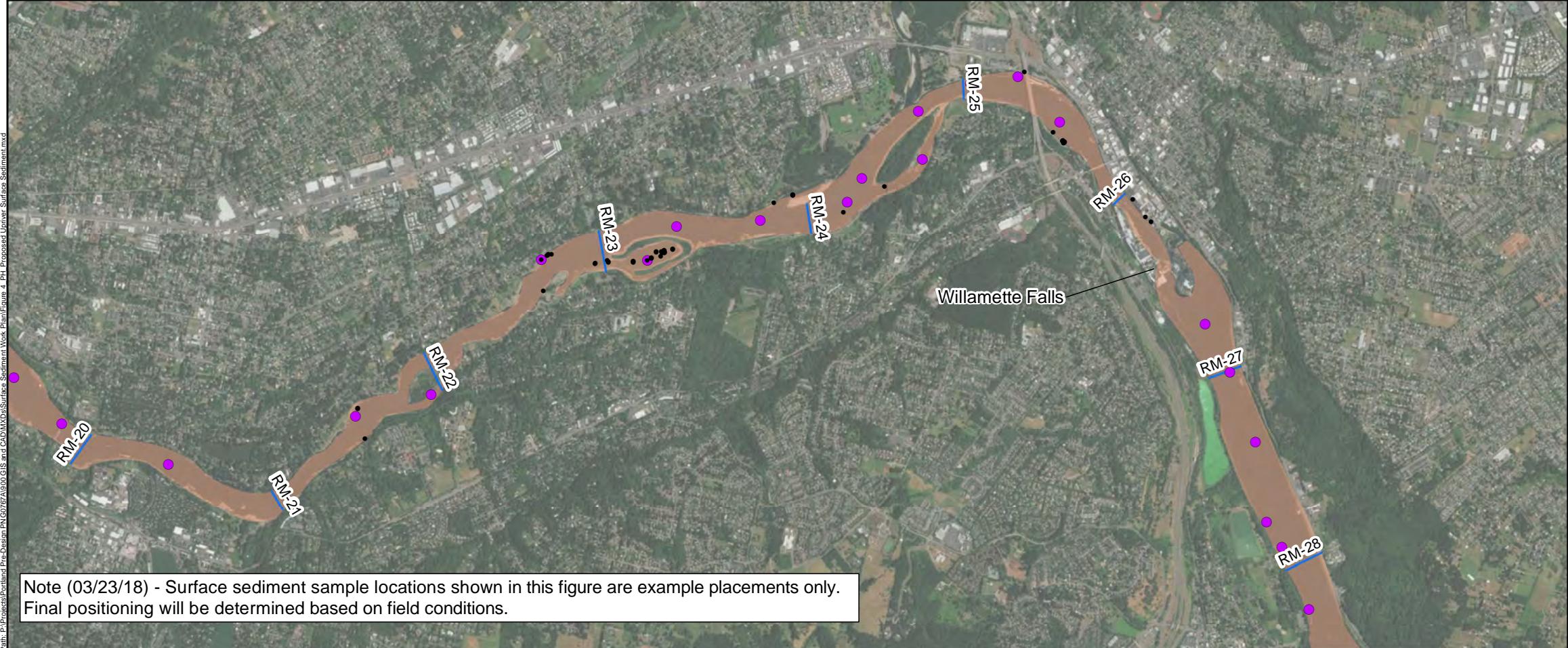
**Proposed Surface Sediment Sampling Locations - RM 10 to 11.8**

Portland Harbor Superfund Site  
PDI Surface Sediment FSP

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Figure  
**2e**

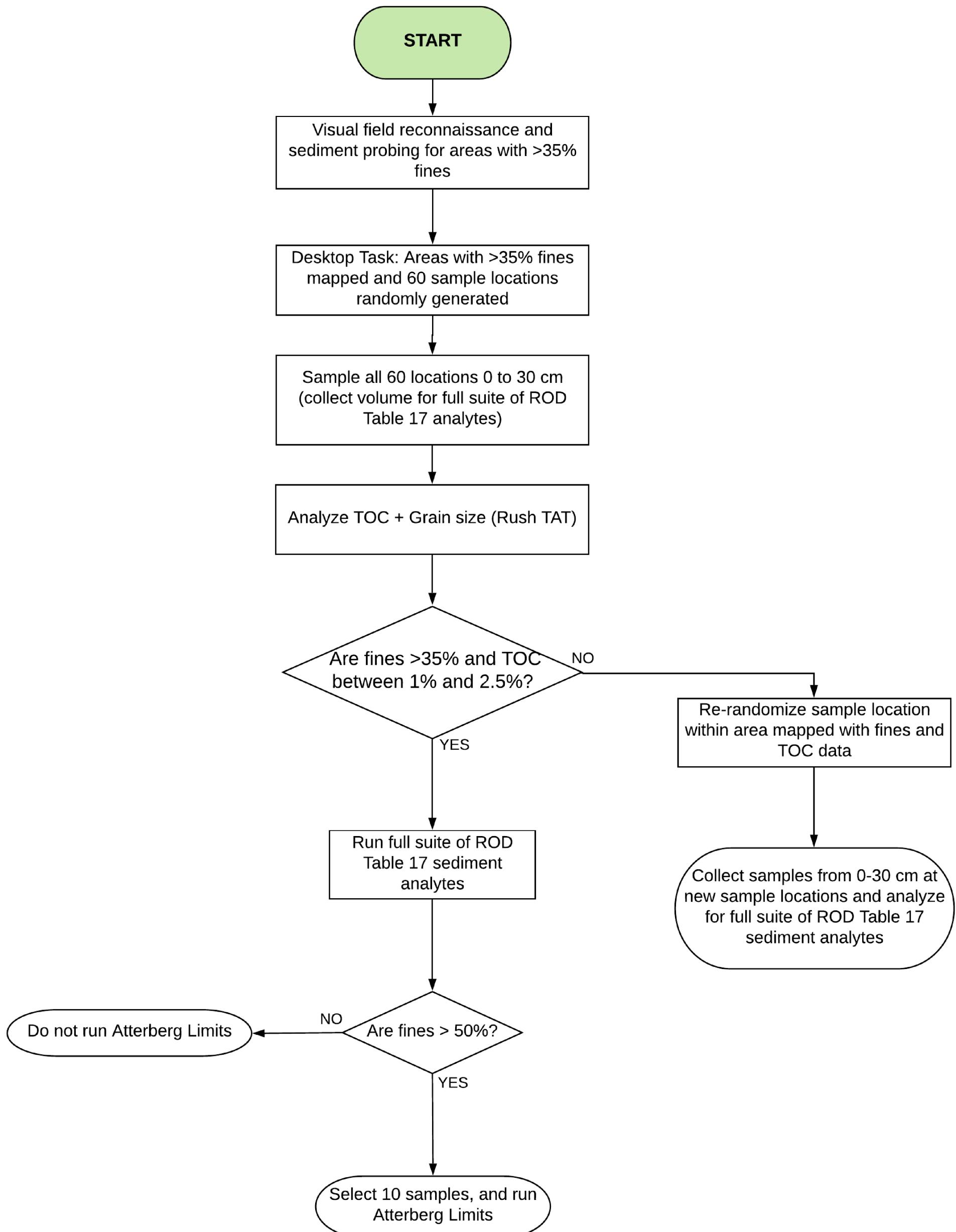




**Notes:**

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. RM = River Mile.
3. Upriver sampling area consists of the Downtown Reach (RM 11.8 to 16.6) and Upstream Reach (RM 16.6 to 28.4) (EPA, 2017).
4. RI samples obtained from EPA, 2016. *Portland Harbor RI/FS, Final Remedial Investigation Report, Portland Oregon. United States Environmental Protection Agency Region 10, Seattle, Washington.* 8 February.
5. Post RI samples obtained from GSI Water Solutions, Inc. (GSI), and Hart Crowser, Inc., 2010. *Field and Data Report, Downtown Portland Sediment Characterization Phase II, Willamette River, Portland, Oregon* and Kleinfelder, 2015. *Sediment Sampling Data Report, Portland Harbor, Portland, Oregon. Prepared for de maximis Inc.* 1 June. Prepared for Oregon Department of Environmental Quality.
6. Zidell Cap is approximate only; Figure 5-4 Sediment Alternative 4 (ZRZ Realty Company), Dated 2004-11-01, Revised 2004-11-29
7. Sediment grab locations to be confirmed in the field and placed in areas of fine-grained material
8. The 60 proposed grab locations were divided (30 ea) between the Downtown and the Upriver reaches.





Downtown/Upstream Reaches Sediment Sampling  
Decision Flow Chart

Portland Harbor Superfund Site  
PDI Surface Sediment FSP

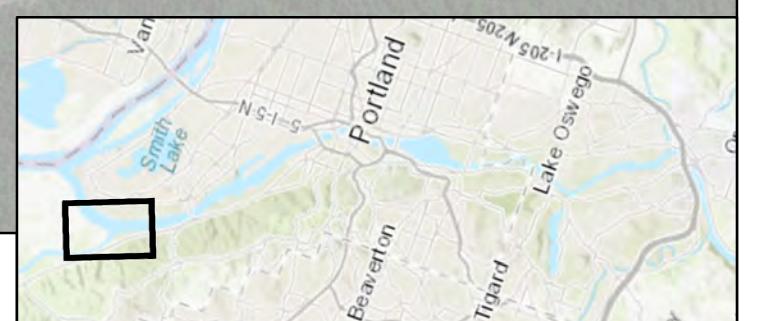
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Figure  
**5**



Path: P:\Projects\Portland\Pre-Design\PN05\67A00\GIS and CAD\UXD\Surface Sediment Work Plan\PH.mxd\Surface Sediment Work Plan\PH.sldx\Proposed locations\_Alt 1 20171220.mxd



**Proposed Stratified Random Site Sample Locations  
(Alternate 1)  
RM 1.9 to 4**

Portland Harbor Superfund Site  
PDI Surface Sediment FSP

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Figure

6a

MI/SEA

March 23, 2018



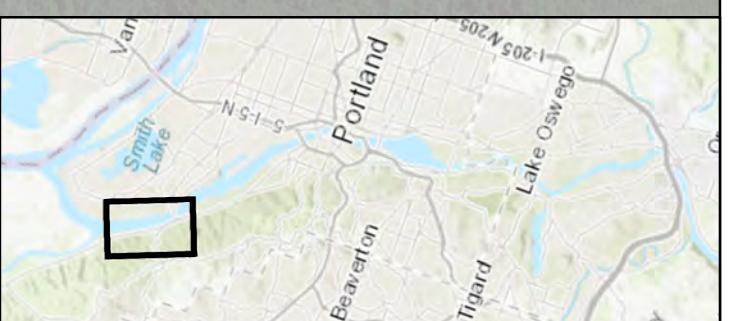
#### Legend

- Stratified Random Samples (n = 428) — River Mile Marker
- Randomized Sample Grid Cells
- Capped Area (Existing)
- Alternative F Mod SMA Footprint

#### Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. n - sample count, RM - river mile, SMA - Sediment Management Area.

1,000 500 0 1,000 2,000 Feet



**Proposed Stratified Random Site Sample Locations  
(Alternate 1)  
RM 4 to 6**

Portland Harbor Superfund Site  
PDI Surface Sediment FSP

**AECOM Geosyntec**  
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Figure

**6b**

MI/SEA

March 23, 2018

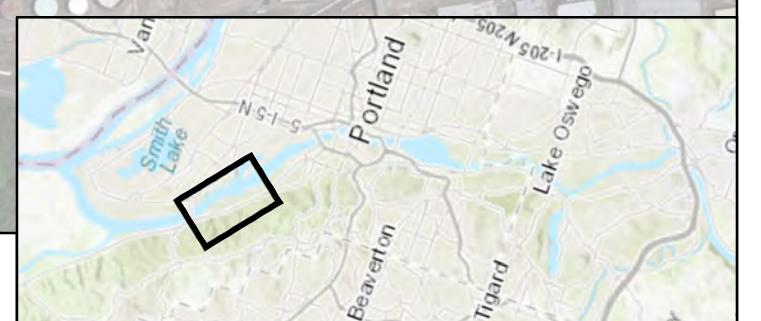
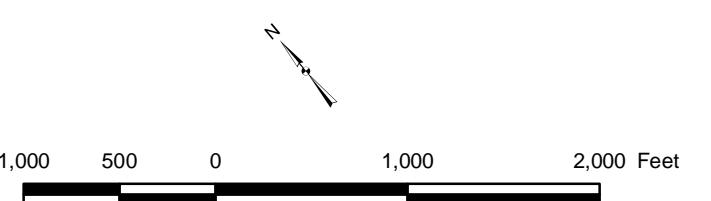


#### Legend

- Stratified Random Samples (n = 428) — River Mile Marker
- Randomized Sample Grid Cells
- Capped Area (Existing)
- Alternative F Mod SMA Footprint

#### Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. n - sample count, RM - river mile, SMA - Sediment Management Area.



**Proposed Stratified Random Site Sample Locations  
(Alternate 1)  
RM 6 to 8**

Portland Harbor Superfund Site  
PDI Surface Sediment FSP

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Figure

6c

MI/SEA

March 23, 2018

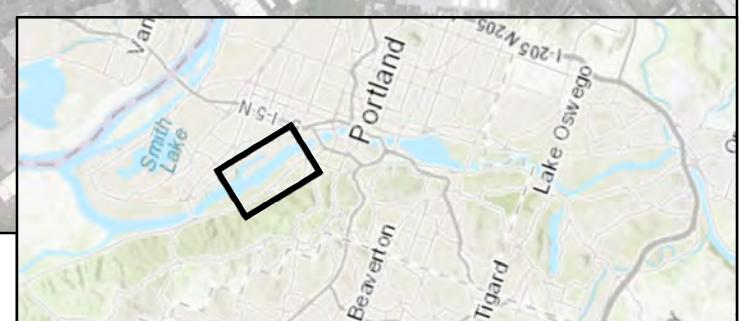
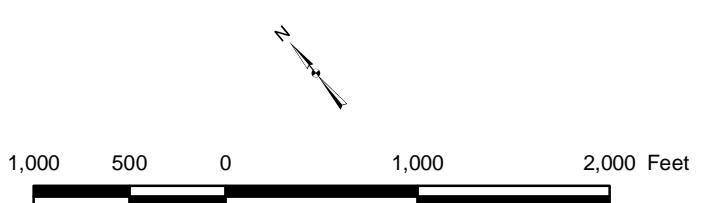


#### Legend

- Stratified Random Samples (n = 428)
- River Mile Marker
- Randomized Sample Grid Cells
- Capped Area (Existing)
- Alternative F Mod SMA Footprint

#### Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. n - sample count, RM - river mile, SMA - Sediment Management Area.



**Proposed Stratified Random Site Sample Locations  
(Alternate 1)  
RM 8 to 10**

Portland Harbor Superfund Site  
PDI Surface Sediment FSP

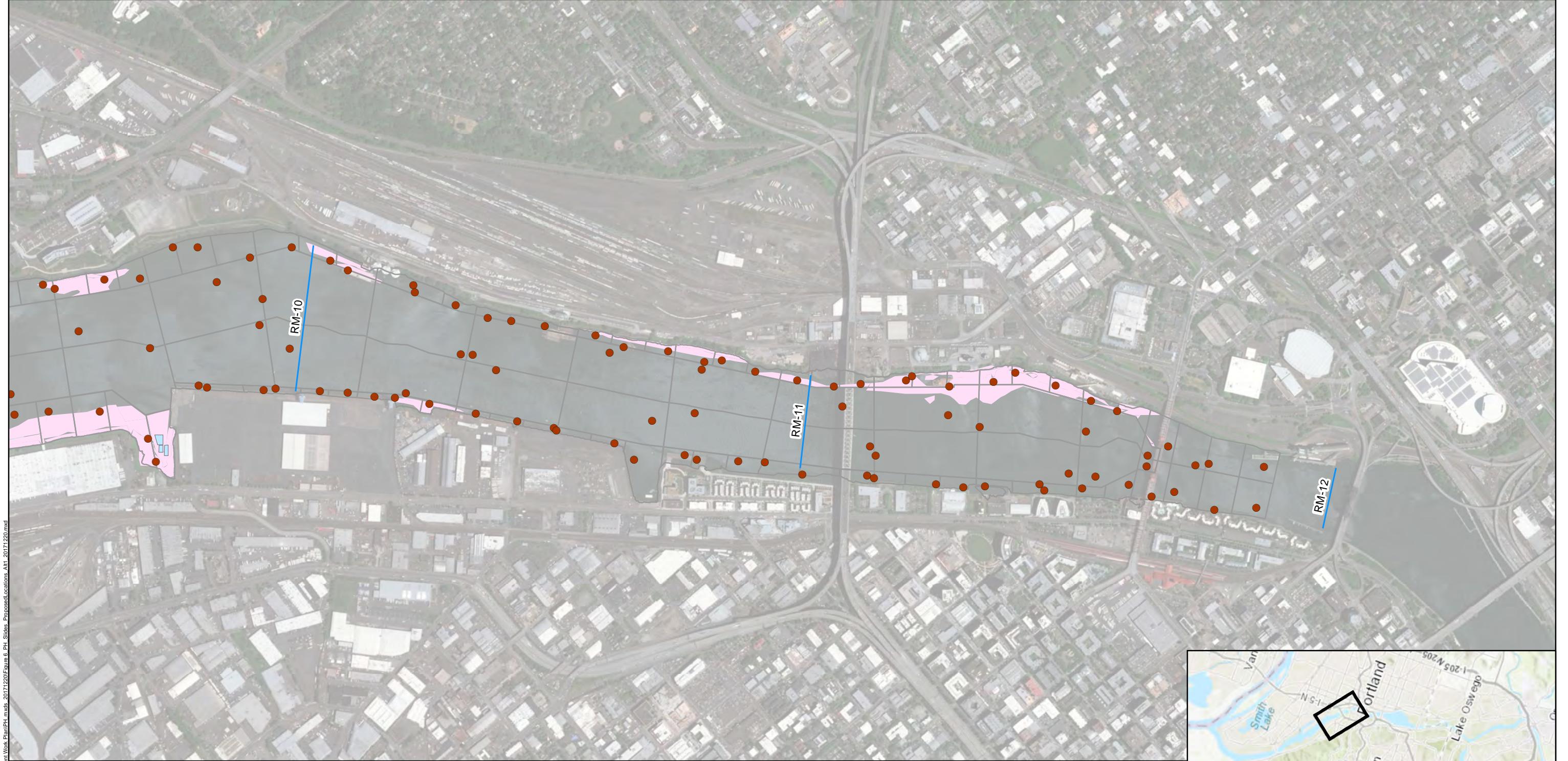
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Figure

6d

MI/SEA

March 23, 2018

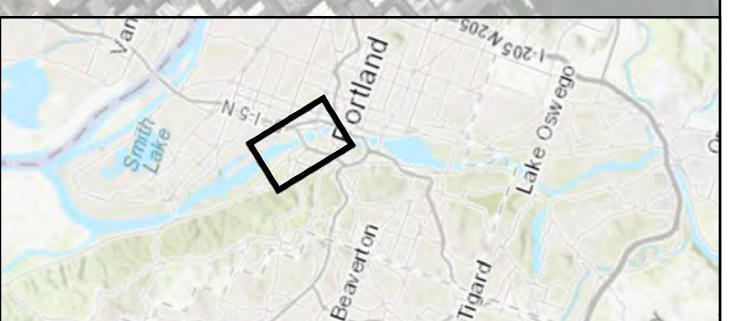
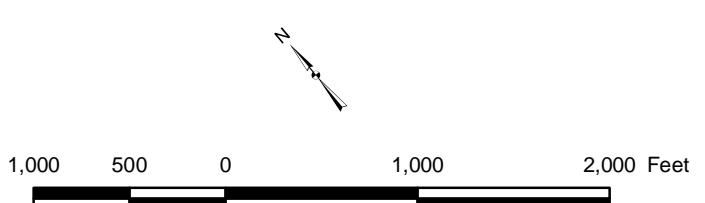


#### Legend

- Stratified Random Samples (n = 428) — River Mile Marker
- Randomized Sample Grid Cells
- Capped Area (Existing)
- Alternative F Mod SMA Footprint

#### Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. n - sample count, RM - river mile, SMA - Sediment Management Area.



**Proposed Stratified Random Site Sample Locations  
(Alternate 1)  
RM 10 to 11.8**

Portland Harbor Superfund Site  
PDI Surface Sediment FSP

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Figure

6e



#### Legend

- Stratified Random Samples (n = 428) — River Mile Marker
- Randomized Sample Grid Cells
- Capped Area (Existing)
- Alternative F Mod SMA Footprint

#### Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. n - sample count, RM - river mile, SMA - Sediment Management Area.

1,000 500 0 1,000 2,000 Feet



**Proposed Stratified Random Site Sample Locations  
(Alternate 2)  
RM 1.9 to 4**

Portland Harbor Superfund Site  
PDI Surface Sediment FSP

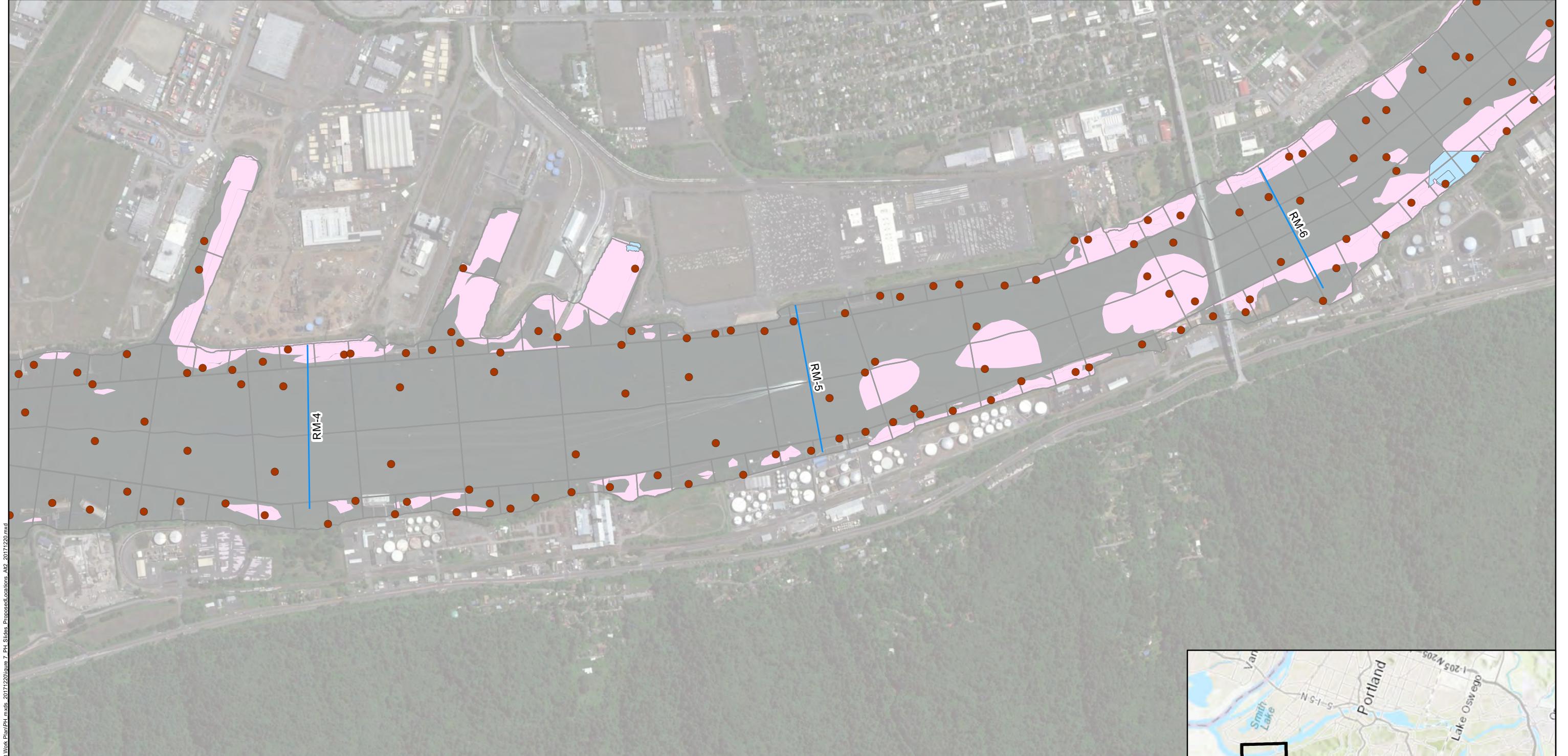
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Figure

7a

MI/SEA

March 23, 2018



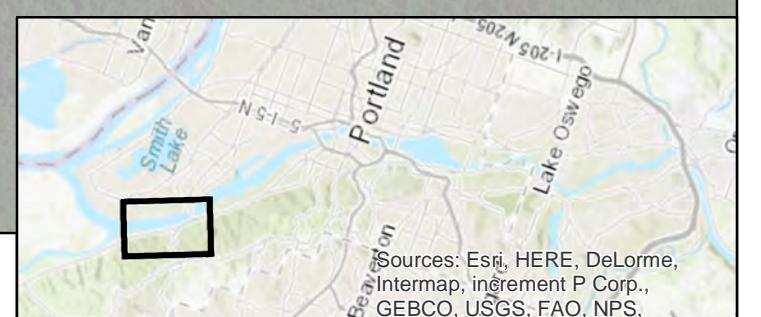
#### Legend

- Stratified Random Samples (n = 428) — River Mile Marker
- Randomized Sample Grid Cells
- Capped Area (Existing)
- Alternative F Mod SMA Footprint

#### Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. n - sample count, RM - river mile, SMA - Sediment Management Area.

1,000 500 0 1,000 2,000 Feet



**Proposed Stratified Random Site Sample Locations  
(Alternate 2)  
RM 4 to 6**

Portland Harbor Superfund Site  
PDI Surface Sediment FSP

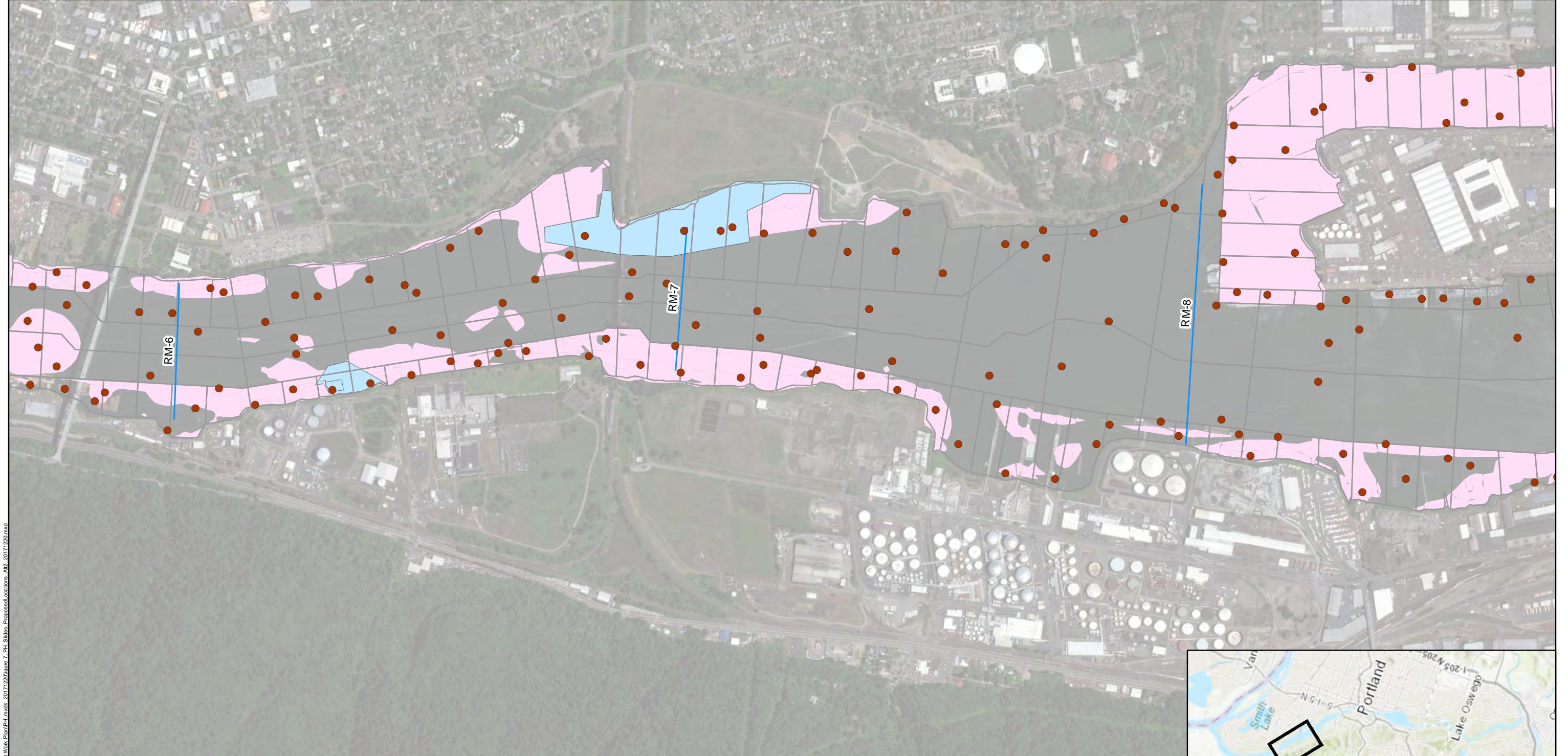
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Figure

7b

MI/SEA

March 23, 2018

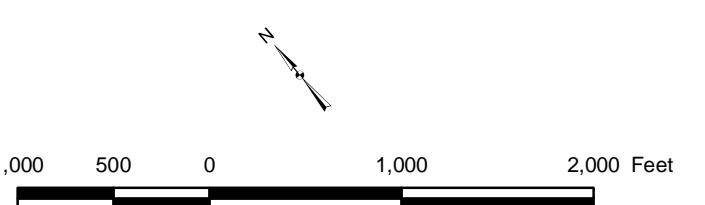


#### Legend

- Stratified Random Samples (n = 428)
- River Mile Marker
- Randomized Sample Grid Cells
- Capped Area (Existing)
- Alternative F Mod SMA Footprint

#### Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Surface sediment samples are defined as the 0-30 cm depth.
3. n - sample count, RM - river mile, SMA - Sediment Management Area.



**Proposed Stratified Random Site Sample Locations  
(Alternate 2)  
RM 6 to 8**

Portland Harbor Superfund Site  
PDI Surface Sediment FSP

**AECOM** Geosyntec  
consultants

Figure

7c

MI/SEA

March 23, 2018

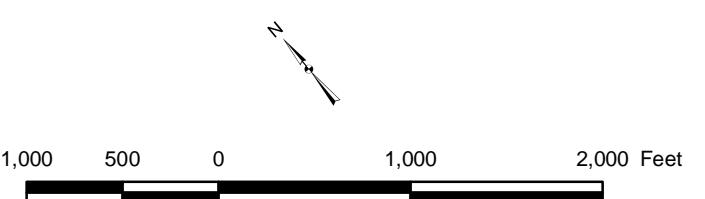


#### Legend

- Stratified Random Samples (n = 428)
- Randomized Sample Grid Cells
- Capped Area (Existing)
- Alternative F Mod SMA Footprint
- River Mile Marker

#### Notes:

- Aerial Imagery provided by ESRI Basemaps 2017.
- Surface sediment samples are defined as the 0-30 cm depth.
- n - sample count, RM - river mile, SMA - Sediment Management Area.



**Proposed Stratified Random Site Sample Locations  
(Alternate 2)  
RM 8 to 10**

Portland Harbor Superfund Site  
PDI Surface Sediment FSP

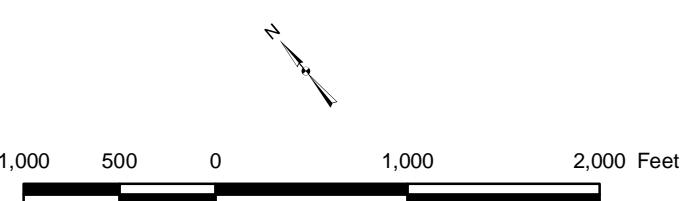
**AECOM** Geosyntec  
consultants

Figure

7d

MI/SEA

March 23, 2018



**Proposed Stratified Random Site Sample Locations  
(Alternate 2)  
RM 10 to 11.8**

Portland Harbor Superfund Site  
PDI Surface Sediment FSP

**AECOM Geosyntec**  
consultants

Figure

7e

## **APPENDIX A - Sediment Logging Keys, Equipment Checklist, and Field Forms**

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A-1. Summary of the ASTM Visual-Soil Classification Method and Sediment Sample Logging Key

A-2. Equipment Checklist

A-3. Field Forms

**Appendix A-1 Summary of the ASTM Visual-Soil  
Classification Method and Sediment Sampling  
Logging Key**

MAJOR DIVISION		GROUP SYMBOL	LETTER SYMBOL	GROUP NAME
COARSE GRAINED SOILS CONTAINS MORE THAN 50% FINES	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVEL WITH <u>5% FINES</u>	GW	Well-graded GRAVEL
			GP	Poorly graded GRAVEL
			GW-GM	Well-graded GRAVEL with silt
		GRAVEL WITH BETWEEN 5% AND 15% FINES	GW-GC	Well-graded GRAVEL with clay
			GP-GM	Poorly graded GRAVEL with silt
		GRAVEL WITH $\geq 15\%$ FINES	GP-GC	Poorly graded GRAVEL with clay
			GM	Silty GRAVEL
			GC	Clayey GRAVEL
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SAND WITH <u>5% FINES</u>	SW	Well-graded SAND
			SP	Poorly graded SAND
			SW-SM	Well-graded SAND with silt
		SAND WITH BETWEEN 5% AND 15% FINES	SW-SC	Well-graded SAND with clay
			SP-SM	Poorly graded SAND with silt
			SP-SC	Poorly graded SAND with clay
		SAND WITH $\geq 15\%$ FINES	SM	Silty SAND
			SC	Clayey SAND
FINE GRAINED SOILS CONTAINS MORE THAN 50% FINES	SILT AND CLAY	LIQUID LIMIT <u>LESS THAN 50</u>	ML	Inorganic SILT with low plasticity
			CL	Lean inorganic CLAY with low plasticity
			OL	Organic SILT with low plasticity
	LIQUID LIMIT <u>GREATER THAN 50</u>		MH	Elastic inorganic SILT with moderate to high plasticity
			CH	Fat inorganic CLAY with moderate to high plasticity
			OH	Organic SILT or CLAY with moderate to high plasticity
HIGHLY ORGANIC SOILS			PT	PEAT soils with high organic contents

**Notes**

1. Sample descriptions are based on visual field and laboratory observations using classification methods of ASTM D2488. Where laboratory data are available, classifications are in accordance with ASTM D2487.
2. Same percentage distribution and group name method applies to fine-grained soils and % of sand and gravel it contains.
3. Fines are material passing the U.S. Std. #200 Sieve.

	<b>PDI Portland Harbor Superfund Site Pre-Remedial Design and Baseline Sampling Portland, OR</b>	<b>Appendix A-1: Summary of the ASTM Visual-Soil Classification Method</b>
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# Appendix A-1

## Portland Harbor PDI Sediment

### Sample Logging Key

**Visual Sediment Descriptions consist of the following:**

- Moisture content
- Density/consistency (estimated based on visual observation)
- Color (Munsell Number)
- Major/Minor Constituents
- Amount and shape of minor constituents and major constituent structure
- Sheen and odor
- Redox potential discontinuity

*Example:* wet, soft, olive green (GEY 1, 5/10Y) clayey SILT, little sand, moderate shell fragments, and trace twigs and rootlets. Silt texture is uniform, slightly compressible, massive, blocky, and of low plasticity. Slight odor and trace sheen. RPD 1 cm.

**Sediment Description Terminology:** Estimated based on visual observations

**Moisture Content**

Dry	Little perceptible moisture
Damp	Some perceptible moisture, probably below optimum
Moist	Probably near optimum moisture content, no visible water
Wet	Visible free water, probably above optimum

**Density: Visual Core Drive Penetration**

SAND or GRAVEL		SILT or CLAY
Density	Visual	Consistency
Very loose	freefall	Very soft
Loose	easy penetration	Soft
Medium dense	moderate penetration	Medium stiff
Dense	hard penetration	Stiff
Very dense	refusal	Very Stiff/Hard

**Color descriptions in Munsell Charts**

**MAJOR and Minor Constituent % (by weight)**

Core Logs	Percent	Field Logs
Trace (clay, silt, etc.)	0-5	not identified
Few (clay, silt, etc.)	5-15	Slightly (clayey, silty, etc.)
Little (clay, silt, etc.)	15-30	Clayey, silty, sandy, gravelly
Clayey, silty, sandy, gravelly	30-50	Very (clayey, silty, sandy, etc.)
GROUP NAME	> 50	GROUP NAME

**Other Minor Constituents: % (by volume)**

(i.e., shells, wood, organics, plastic, non-native debris)

Trace	0-5
Scattered	5-10
Moderate	10-30
Substantial	30-50
GROUP NAME	> 50

**Structure**

Stratified	Alternating layers of varied material/color at least 1/4" thick
Laminated	Alternating layers of varied material/color at least 1/4 mm thick
Blocky	Cohesive soil that can be broken down into smaller lumps
Spongy	Organic and compressible nature
Lensed	Inclusion of thin discontinuous layers of different sediment
Homogenous/Massive	Same color and appearance throughout
Fibrous	Stringy or rope like structure
Seam	1/16 to 1/2" thick
Layer	greater than 1/2" thick
Interbedded	Multiple beds within a unit
Rolls Easily	Play-dough like (plasticity observation)
Angular	Sharp edges
Subangular	Rounded edges
Subrounded	Well-rounded edges
Rounded	Smoothed, no edges

**Odor Descriptions**

none
trace
slight
moderate
strong

**Sheen Test- % coverage**

S.T. = Sheen test visual analysis	
none, trace	<2
slight sheen	2-15
moderate sheen	15-40
moderate to heavy	40-70
heavy	>70

**Sheen Test- Visual Description**

rainbow	multicolored
metallic	metallic gray-colored
florets	semi-circular and multicolored
streaks	long and flowing shape

**Other Sediment Descriptions Used**

Agglomerate	Fused-appearance, often vesicular
Clast/inclusion	Non-fused appearance
Xenoclasts	Clasts that have been moved
Fresh	No visible sign of decomposition or discoloration
Winnowed	Loss of fines
Slumped	Settled but intact
Pockets/balls	Semicircular to circular inclusion/deposit
Chunky	Mass of unidentified material

**Sediment Core Log Guidelines**

color or minor change
major sediment change
depositional change

**Core Acceptance Guidelines**

1. Desired drive/penetration depth is reached.
2. Core recovery is greater than 70%.
3. Core tube appears intact (no signs of blocking, bending).
4. Minimal sediment loss out the top or bottom (minimal winnowing).

**Grab Acceptance Guidelines**

1. No or minimal excess water leaking from the jaws of the sampler.
2. No excessive turbidity in the overlying water of the sampler.
3. Sampler did not over-penetrate.
4. Sediment surface appears to be intact with minimal disturbance.
5. Program-specific penetration (30 centimeters) has been achieved.

**NOTES:**

\*Classification of sediment on core logs is based on visual field observations.

Classification notes should not be construed to imply laboratory testing unless presented herein. Unified Soil Classification System ASTM D-2487 and Visual-manual classification method ASTM D-2488 for the description and identification of soils were used as an identification guide.

## Appendix A-2 Portland Harbor PDI Sediment Sampling Equipment List

### Safety Equipment

GPS

Cell phones (fully charged) or Satellite phone (if no cell coverage)

VHF radios

Rescue rope in throw bag

Air horns and/or whistles

Waterproof flashlight

Secondary "kicker" motor or alternative propulsion

Bailer or bilge pump/emergency pump

Length of rope for securing boat

US Coast Guard approved Type III or V PFD or life jacket

Type 4 throwable ring or cushion

Type BC fire extinguisher (10 pound) if extra fuel is carried in portable containers.

Anchor with appropriate length of line

First-Aid Kit and AED

Oil booms

PID

Bottled water

Snacks

Float plan

### PPE

Boots, waterproof, steel-toed

Gloves, nitrile, heavy outer

Gloves, nitrile, thin inner

Hard hats

Hearing protection

Rain slicks

Safety glasses/goggles

Butcher apron or Tyvek for decon

Warm/dry clothes

### Sample Handling

Vibracore sampler, core and tubes<sup>1</sup>

Hydraulic power grab sampler<sup>2</sup>

Bowls, large, stainless

Spoons, small, stainless

Spoons, large, stainless

Bottleware, sample analyses specific

Sample labels

core caps<sup>1</sup>

core catchers<sup>1</sup>

### Plans

Field Sampling Plan<sup>3</sup>

Maps

Health and Safety Plan

Quality Assurance Program Plan

### Tools

Hacksaw and Circular saw<sup>1</sup>

Extension cord and power strip<sup>1</sup>

Drywall blade, 6"

Ruler (12 inch/30 cm)

Measuring tape (with 1/10 inch increments)<sup>1</sup>

Rubber mallet<sup>1</sup>

Screwdrivers (Phillips, flat)

Siphon tubes<sup>2</sup>

Utility knife

Lead line (if not on vessel)

### Supplies

Handheld GPS, fully charged

Camera

Gas for boat, if applicable

Keys for boat, if applicable

White board, white board markers

Bags, plastic zip, gallon-size

Bags, plastic zip, quart-size

Duct tape, electrical tape, and packing tape

Plastic sheeting

Ice

Logs, field<sup>3</sup>

Field books

Paper towels

Pens, ballpoint, permanent<sup>3</sup>

Sharpies, small and large

Trash bags

Zip ties

4" pipe clamps

Core carrying box

### Decon Equipment

Brushes, long-handled

Brushes, short-handled

Detergent, laboratory (e.g., Alconox)

Methanol/hexane in dispensing bottle (optional)

Nitric acid, 10% in dispensing bottle (optional)

5 gallon buckets, or similar

Aluminum foil

Water, distilled in dispensing bottle

### Notes:

1: Subsurface Coring specific equipment

2: Surface grab sampling specific

3: Write-in-Rain waterproof paper/pens are recommended

Appendix A-3

## **Portland Harbor PDI Surface Sediment Sampling Log**

**Location ID:** \_\_\_\_\_

**Sample Date:** \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

<b>Weather Conditions:</b>	<b>Sampling Personnel:</b>
<b>Tide (CRD):</b>	

<b>Sample Area</b> (circle one):	Baseline/BL	SMA/In-water Core	Downtown/Upriver
<b>Analytical Suite</b> (circle one):	Full ROD Table 17	Four Focused COCs	

Sediment A Description		
Moisture:	Density:	Color:
Minor/Major Constituent %:		
Structure:		
Odor/Sheen:		
Redox Potential Discontinuity (RPD):	cm	
Other:		

Sediment B Description		
Moisture:	Density:	Color:
Minor/Major Constituent %:		
Structure:		
Odor/Sheen:		
Redox Potential Discontinuity (RPD):	cm	
Other:		

Sediment C Description		
Moisture:	Density:	Color:
Minor/Major Constituent %:		
Structure:		
Odor/Sheen:		
Redox Potential Discontinuity (RPD):	cm	
Other:		

Primary Sample Information		
Sample ID	Time	Containers

QA/QC Sample Information				
Sample ID	Time	QA/QC Type	Containers	Primary Sample

### EPA Oversight During Sample Collection? No Yes

### **Additional Comments**

## **APPENDIX B – Standard Operating Procedures**

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B-1. Horizontal and Vertical Station Control

B-2. Surface Sediment Sampling (Integral 2004)

B-3. Management of IDW

## **APPENDIX B – Standard Operating Procedures**

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### B-1. Horizontal and Vertical Station Control

# **STANDARD OPERATING PROCEDURE**

## **HORIZONTAL AND VERTICAL SURVEY CONTROL**

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*The methods and standards proposed in this Standard Operating Procedure (SOP) should be considered provisional and are subject to revision based on a two-week period associated with the initial sampling activities anticipated to begin on or about March 28, 2018. During this period, AECOM will work with project team member David Evans and Associates, Inc. (DEA) and their Oregon Professional Land Surveyor (PLS) staff to validate, methods, controls, and standards. United States Environmental Protection Agency (EPA) Region 10 will be debriefed on the outcome and consulted for approval of any changes or modifications to this SOP.*

### **Introduction**

This Standard Operating Procedure (SOP) has been developed for the Pre-Remedial Design Sampling and Baseline Investigations (PDI) at the Portland Harbor Superfund Site located in Portland, Oregon to confirm accurate positioning of vessels and samples during sample collection activities. The survey control requirements described in this SOP are specifically for environmental sample collection and will generally comply with map-grade precision and accuracy in contrast to the geodetic-grade precision and accuracy anticipated for the Bathymetric Survey conducted by DEA. However, the same survey control points and geodetic parameters will be used in both surveys for consistency, and a portion of the quality assurance/quality control (QA/QC) process will involve consultation with DEA PLS staff to review the map-grade data collected for the environmental sample collection.

The organization of remainder of this SOP is as follows:

- Methodology Overview
- Project Geodetic Parameters
- Survey Accuracy, Precision, and Control
- Primary Equipment
- Hand-Held GPS Operation
- Vessel Navigation and Equipment Operation
- Data Processing and QA/QC Procedures

Tables, figures, and attachments are presented at the end of the SOP.

### **Methodology Overview**

#### ***Horizontal (Map) Data Collection***

A combination of vessel-mounted and hand-held GPS receivers will be used to navigate to sampling locations and to collect map location coordinates (Northings, Eastings) for those sampling locations. The vessel-mounted GPS receivers will be the primary tool used for navigation to the pre-planned sampling locations recorded in georeferenced basemap which will be pre-loaded into the vessel

navigational system. The hand-held GPS devices will be used as a backup and confirmation of vessel position; these devices will also have the pre-loaded basemap content depicting planned sampling locations.

The vessel GPS will operate in two modes, collecting both a separate continuous data stream of positional information (line file) and recording GPS soundings (target file) when a sample is specifically collected. The sample location target file will be recorded when the sampling device is in position for the grab (e.g., when sampler is on the river bottom). The specific Location ID associated with the sample will also be recorded in the GPS device log. Field personnel will be required to write that same Location ID on their field data collection forms at the same time. Both the continuous and episodic dataset will be timestamped to allow comparison of the two types of data. This data will be recorded and maintained on the vessel, and will also be exported from the vessel navigation system and archived to project servers on a daily basis.

The hand-held GPS devices will be operated independently of the vessel's systems and will be used to record a location sounding wherever a sample is collected. The sample location sounding will be recorded approximately at the same time as when the vessel GPS measurement is collected (e.g., when sampler is in position). The specific Location ID associated with the sample will also be recorded on the GPS device. Field personnel will write this Location ID on the field forms only if the vessel measurement described earlier cannot be collected for some reason (e.g., equipment failure). These measurements will also be timestamped in approximate synchronization with the vessel's time recording system. The data from the hand-held GPS devices will be wirelessly synchronized to a "cloud" web service in near real-time; the data from the "cloud" will also be downloaded and saved to project servers daily.

### ***Vertical Data Collection***

Vertical (elevation) data is also required for water levels, sample collection depth below surface water, and bottom (mudline) depth location for some types of sample locations. For increased precision and accuracy, it is proposed that bottom (mudline) depth locations (e.g., for sediment cores) be calculated from the bathymetric surface to be developed by the hydrographic survey performed by DEA (since the data will be collected within a few months of each other). The NAVD88 elevation will be calculated from the intersection of the surface map location coordinates collected as described earlier, projected vertically down to the bathymetric surface (United States Army Corps of Engineers [USACE], 2004). The elevation from the intersection of the bathymetric surface will be used as the final or "best" elevation for the sample.

In contrast, for depth measurements that require less precision (e.g., water levels, depth to samples below water surface), the onboard vessel sonar will be used to record depth and then subsequently calculate elevation. All depths will be recorded relative to the water surface and time tagged to correct with time tagged gauge data for obtaining riverbed elevations. The elevation will be calculated to NAVD88 datum. To correct elevations, gauge data from the Northwest River Forecast Center will be downloaded for gauge PRT03, which is representative of the former Morrison gauge which has been moved. This gauge does not report NAVD88 elevations but rather reports a value that is 0.3 feet above

Columbia River Datum (CRD). Corrections from CRD to NAVD88 differ moving down the river from the gauge due to the fact that NAVD88 is a reference normal to gravity (water does not flow if the elevation is unchanging), and CRD is a gradient datum that follows the lower water surface. In Portland Harbor the difference between CRD and NAVD88 (Geoid12b) ranges from 0.00 feet CRD = -5.16 feet NAVD88 (Geoid12b) at Willamette river mile 2.0, to 0.00 feet CRD = -5.41 feet NAVD88 (Geoid12b) at Willamette river mile 12.8 (approximate location of PRT03 Gauge). Accordingly, a correction to the Willamette Gauge in Portland would be  $-5.41+0.3$  or -5.11 feet at mile 12.8. An approximation would be to subtract 5 feet from the gauge reading for the full length of the study area, but precision will vary depending on tides and river gradient.

For sample locations requiring vertical information, depth will be recorded by field staff on their data collection forms relative to the water surface, and these values will be loaded to the project database as described in the Data Quality Management Plan (DQMP). Final calculated NAVD88 elevation data (feet) will also be entered into a separate data field in the project database after completion of spatial analysis, calculations, and QA/QC. DEA will provide support during the QA/QC process to verify proper calculation of NAVD88 elevation data.

### ***Location Position Recording in Project Database***

#### **Discrete Samples**

When discrete samples are collected, the Location ID and the location coordinates (Northing/Easting) will be recorded on the GPS device(s) and the field data collection form(s). The location coordinates will be based on the vessel GPS instantaneous target measurement. This target measurement will be the location coordinate pair loaded initially to the project database. After the field event is completed, the target measurement will be compared to the line file (vessel continuous GPS measurement) to confirm that the coordinate pair loaded to the project database is appropriate. If analysis reveals precision or accuracy issues, the loaded location coordinate pair in the project database may be updated and edited with a better value derived from the line file. In general, the hand-held GPS data will only be used as an independent cross-check of location coordinate information and will be loaded to the project database only if there is a significant problem with the vessel GPS (e.g., equipment failure).

#### **Composite Samples**

When composite samples are collected, location coordinates will also be recorded as both target measurements and continuous measurements using the vessel GPS. The continuous GPS measurements will be recorded during the entire composting event, and instantaneous target measurements will be collected when the sampler is in position for each individual composite grab. At each composting location, a target measurement will be recorded in the vessel GPS along with the Location ID with an “a,” “b,” or “c” suffix. These measurements will be recorded on the field forms in the same manner (e.g., there will be three sets of location coordinates, lithologic descriptions, etc.).

When the location data is loaded to the project database, a single set of location coordinates will be recorded in the project database with a Location ID that excludes the “a,” “b,” or “c” suffix. As a presumed middle time point, the “b” set of coordinates will be loaded with the primary Location ID to

the project database. After the field event is completed, the target measurement associated with the “b” location composite will be compared to the line file (vessel continuous GPS measurement) to assess vessel position and the timeframe of the entire sampling event to confirm if the coordinate pair loaded to the project database is appropriate. The goal will be to finalize the location coordinate information in the project database based on the most representative position based on this analysis. Similar to discrete sample collection, the hand-held GPS data will be loaded to the project database only if there is a significant problem with operation of the vessel GPS.

Finally, after field data are collected and surveys are completed, as defined in the DQMP, the location coordinate data will be joined with the tabular data collected by the field teams and loaded to the project database.

## **Project Geodetic Parameters**

The geodetic parameters to be used for the PDI field studies will be as follows:

**Horizontal Datum:** North American Datum of 1983 (2011)

**Projection:** State Plane Coordinate System (SPCS) Oregon North Zone

**Vertical Datum:** North American Vertical Datum of 1988 (NAVD88) Geoid12b

**Units:** International Feet

## **Survey Accuracy, Precision, and Control**

The anticipated horizontal accuracy of environmental sampling associated with vessel and hand-held GPS devices is a range of 1 to 5 meters (target 1 to 2 meters for the DGPS unit itself). This should be consistent with RI target accuracy (Integral 2002) and best practices (Puget Sound Estuary Protocols [PSEP] 1998 and USEPA 2008).

The anticipated vertical accuracy of final elevation calculations derived from vessel sonar systems is anticipated to be 1.0 meter.

Table 1 summarizes the survey control locations used in the DEA Bathymetric Survey, which will be used for the environment sample collection work described in this SOP. Figure 1 shows the approximate locations of the survey control references. Attachment 1 contains detailed survey sheets of the control points: Raindeer, PH1, and 2100.

## **Primary Equipment**

- Trimble® 461 GPS with dual antennas (vessel GPS)
- A-frame assembly, sampling winch (vessel boom)
- Trimble® R1 (hand held GPS), tethered to Bluetooth® capable smartphone or tablet, ESRI Collector software with Trimble® GNSS Status middleware
- GPS owner’s manual
- Writing tools (pencils, Sharpie®)

- Field logbook
- Spare batteries and/or battery charger
- Compass
- Tape measure

## **Hand-Held GPS Operations**

For ease of use, the project team will utilize smartphones tethered to the Trimble® R1 GNSS Receiver via a Bluetooth® connection. The smartphone will be configured with Trimble’s middleware software called GNSS Status to convert and stream NMEA satellite data to the smartphone for real-time correction and display to a simple electronic data collection form developed on the ESRI Collector platform. The form will contain a pre-loaded list of valid Locations IDs associated with all the sampling studies, and a limited number of other data fields including study name and operator. This form is not intended to duplicate the content and scope of the field data collection forms, but rather clearly link the GPS data to those forms via the unique Location ID.

Collected data will be recorded onto the phone and transmitted wirelessly via a synchronization process invoked when data is “saved” to the device. The data will be pushed to AECOM Online’s Portal and ArcGIS Server for storage of “corrected” location coordinates, Location ID, and other information captured when the GPS sounding is recorded. The sampling event will be trackable in near-real-time as samples are collected on the ArcGIS Portal Interface. Either dedicated, experienced GPS-operators will be collecting the measurements on the smartphones, or, due to the very simple nature of the interface, field personnel will be trained to use the devices. Initial training sessions were already successfully conducted March 19-20, 2018 on use of the smartphone GPS interface.

## **Vessel Navigation and Equipment Operation**

Vessel positioning will be conducted through the marine navigation and hydrographic software package HYPACK. This software package allows the visualization of the vessel over navigable charts, the processing of satellite corrections, stored hardware, and vessel parameters, as well as the storing of physical target locations during sampling activities. HYPACK version 2017 will be used for this project.

Vessel position is measured using a Trimble 461 GPS with dual antennas. The dual antennas provide precise vessel positioning via both satellite and differential radio corrections along with heading correction to 0.1 degree. GPS data is output through a serial connection into computer running the HYPACK software, for vessel positioning and target collection.

At each sampling location, depth to mudline will be measured using an onboard fathometer (with lead line as confirmation as needed) immediately prior to or during the sampling. Water depths are measured at each station using an Airmar ss510 survey sonar at the sampling point and confirmed daily with a lead line with reference to water surface. Vertical measurements will be recorded to the nearest 0.1 foot. Water depths will be converted to elevations in NAVD88 based on the river stage at the time of sampling as recorded at the closest available tide gage.

## **Data Processing and QA/QC Procedures**

All GPS systems will perform a position check to confirm the accuracy of the on-vessel GPS and hand-held GPS devices and validate the positions derived from each GPS receiver. Correctors being applied as needed, resulting in a position that is within specified positioning accuracy of the DEA published position for control monument PH-1. At the start and end of each field day, the PH-1 benchmark location will be visited to perform a position check. At the control monument, the on-vessel GPS mounted to the top of A-frame assembly will be maneuvered over the survey monument. The GPS-derived position of the sampling vessel is compared with the known horizontal location; results will be recorded in the field notebook to confirm that accuracy is within +/- 2 meters. If the GPS cannot be placed on the benchmark location directly, then field staff will record the distance and compass direction to the location as an “offset.” The survey control monuments act as a known location to allow for corrected station location coordinates during post-processing of data as needed. Experienced GPS operators on the project team will be involved in all aspects of field data collection events to troubleshoot devices and assist in daily review of extracted geospatial datasets. Additional details on QA/QC procedures can be found on the DQMP.

## **References**

- AECOM (AECOM Technical Services) and Geosyntec (Geosyntec Consultants, Inc.). 2018. Data Quality Management Plan Portland Harbor Pre-Remedial Design Investigation and Baseline Sampling. Portland Harbor Superfund Site. 22 February.
- Integral (Integral Consulting). 2002. Round 1 Field Sampling Plan. Prepared for the Lower Willamette Group (LWG) for submittal and approval by EPA Region 10. June 14.
- EPA (United States Environmental Protection Agency). 2008. National Geospatial Data Policy. August 24.
- PSEP. 1998. Recommended Guidelines for Station Positioning in Puget Sound. Prepared for United States EPA Region 10 and the Puget Sound Water Quality Action Team. September.
- USACE (United States Army Corps of Engineers). 2004. Engineering and Design Hydrographic Surveying Manual, EM 1110-2-1003, U.S. Army Corps of Engineers, April 2004

## **Attachments**

PH Control Points of 2100, Portland Harbor (PH1), and Raindeer survey monuments

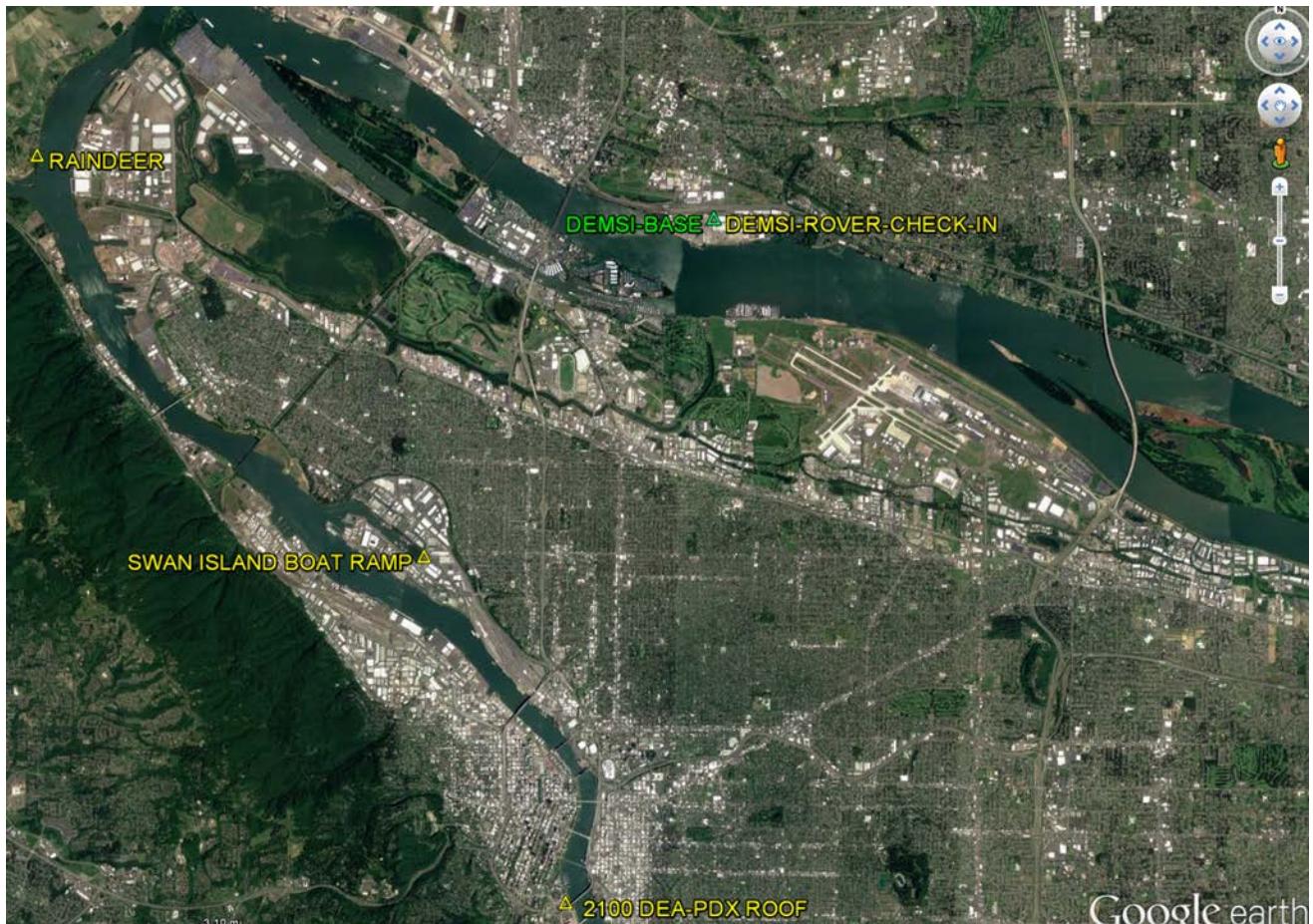
**Table 1. Benchmark Monument Coordinates and Description**

Designation	Approx. Location	Description	NAD83, Oregon SPCS North (ft)		NAVD88 Elevation (ft)
			Northing	Easting	
DEMSI-BASE	Columbia River	Fixed antenna with height at antenna reference point	718172.70	7654431.05	73.58
DEMSI-CHECK	Columbia River	Fixed antenna with height at antenna reference point	718170.73	7654419.84	71.67
RAINDEER	RM 2	USACE Brass Cap	722443.24	7614886.64	35.44
Portland Harbor (PH1)	Swan Island Boat Ramp	1/2" Iron Rod with red plastic cap stamped "DEA Control" Point is 0.3' south of the back of curb at the Swan Island Boat Ramp, 10.5 feet north of a cyclone fence, and 60' east of a light post	698702.46	7637426.37	33.38
2100	RM 13	5/8" bolt on SW corner of screen wall at DEA office 2100 SW River Parkway, Portland, OR	678400.01	7645190.81	159.51

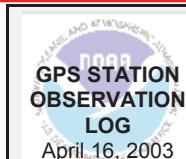
**General Notes:**

1. The two DEMSI and the 2100 stations are transceiver beacon stations in upland areas (Green Shade).
2. PHI is located at the Swan Island boat ramp and accessible by boat.
3. Raindeer station is located adjacent to the river and access by foot (for the hand-held GPS).

**Figure 1. Approximate Survey Control Monument Locations**



NOTE: This form intended for field use. Unsolicited data submitted to NGS must be converted to bluebook format.



GPS STATION OBSERVATION LOG April 16, 2003	Station Designation: (check applicable: FBN CBN PAC SAC BM) <b>2100</b>				Station PID, if any:	Date (UTC): <b>06-Mar-18</b>		
	General Location: Airport ID, if any: <b>DEA Office 2100 SW River Parkway, Portland</b>			Station 4-Character ID:	Day of Year: <b>065</b>			
Project Name: <b>Portland Harbor - AETR00000034</b>		Project Number: <b>GPS-</b>		Station Serial # (SSN):	Session ID:(A,B,C etc)			
NAD83 Latitude o °      "      NAD83 Longitude o °      "      NAD83 Ellipsoidal Height meters NAVD88 Orthometric Ht. meters GEOID99 Geoid Height meters				Agency Full Name: <b>David Evans and Associates, Inc.</b> Operator Full Name: <b>David T. Moehl</b> Phone #: ( ) <b>(360) 314-3200</b> e-mail address: <b>dtm@deainc.com</b>				
Observation Session Times (UTC): Sched. Start _____ Stop _____ Actual Start <b>18:55</b> Stop <b>23:00</b>	Epoch Interval= <b>1</b> Seconds Elevation Mask = <b>10</b> Degrees							
Receiver Brand & Model: <b>Trimble SPS855</b> P/N: <b>69855-60</b> S/N: <b>5506R0075</b> Firmware Version: <b>5.30</b>	Antenna Code*, Brand & Model: <b>Trimble Zephyr 3 Base</b> P/N: <b>115000-10</b> S/N: <b>3121179869</b> Cable Length, meters: <b>10</b>				Antenna plumb before session? <input checked="" type="checkbox"/> / N Circle Antenna plumb after session? <input checked="" type="checkbox"/> / N Yes or No Antenna oriented to true North? <input checked="" type="checkbox"/> / N -If no, Weather observed at antenna ht. <input checked="" type="checkbox"/> / N explain Antenna ground plane used? <input checked="" type="checkbox"/> / N Antenna radome used? <input checked="" type="checkbox"/> / N If yes, Eccentric occupation (>0.5 mm)? <input checked="" type="checkbox"/> / N describe. Any obstructions above 10°? <input checked="" type="checkbox"/> / N Use Radio interference source nearby <input checked="" type="checkbox"/> / N Vis. form			
□ CamCorder Battery, □ 12V DC, <input checked="" type="checkbox"/> 110V AC, □ Other	Vehicle is Parked <b>n/a</b> meters (direction) from antenna.							
Tripod or Antenna Mount: Check one: □ Fixed-Leg Tripod, □ Collapsible-leg tripod <input checked="" type="checkbox"/> Fixed Mount Brand & Model: <b>Bolt</b> P/N: S/N: Last Adjustment date:		<b>** ANTENNA HEIGHT **</b>			Before Session Begins: Meters      Feet	After Session Ends: Meters      Feet		
		<b>A</b> = Datum point to Top of Tripod (Tripod Height)			<b>0.000</b>			
		<b>B</b> =Additional offset to ARP if any (Tribach/Spacer)			<b>0.000</b>			
		<b>H</b> = Antenna Height = <b>A + B</b> = Datum Point to Antenna Reference Point (ARP)			<b>0.000</b>	<b>0.00</b>	<b>0.000</b>	<b>0.00</b>
		Meters = Feet x (0.3048) Height Entered Into Receiver = <b>0.000</b>			Note &/or sketch ANY unusual conditions. Height Entered Into Receiver = <b>0.000</b> meters. Be Very Explicit as to where and how Measured!			
Psychrometer (if used) Brand & Model: P/N: S/N: Last Calibration or check Date:								
Barometer (if used) Brand & Model: S/N:		<b>Weather Data</b>	Weather Codes	Time (UTC)	Dry-Bulb Temp Fahrenheit Celsius	WetBulb Temp Fahrenheit Celsius	Rel. % Humidity	Atm. Pressure inches Hg millibar
		<b>Before</b>	<b>00000</b>	<b>18:55</b>				
		<b>Middle</b>						
		<b>After</b>	<b>00000</b>	<b>23:00</b>				
Remarks, Comments on Problems, Sketches, Pencil Rubbing, etc:								
<p><b>5/8" bolt found on the southeast corner of the VAC screen wall on DEA office roof at 2100 SW River Parkway, Portland, OR. The geodetic antenna was screwed tight to the top of the double nut on the 5/8" bolt. The antenna height = zero to the antenna reference point (bottom of antenna mount).</b></p>								
Weather codes are required. Weather data are optional but encouraged. *Antenna code comes from ant_info file furnished by project coordinator.								
Data File Name(s): <b>00750650.T02</b> (Standard NGS Format = aaaaddds.xxx) where aaa=4-Character ID, ddd=Day of Year, s=Session ID, xxx=file dependant extension				Updated Station Description: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Visibility Obstruction Form: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Photographs of Station: <input checked="" type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Pencil Rubbing of Mark: <input type="checkbox"/> Attached			LOG CHECKED BY: <b>Jon Dasler</b>	
<b>Table of Weather Codes</b>	CODE	PROBLEM	VISIBILITY	TEMPERATURE	CLOUD COVER	WIND		
	<b>0</b>	did not occur	Good, over 15 miles	Normal, 32° F- 80° F	Clear, below 20%	Calm, under 5mph (8km/h)		
	<b>1</b>	did occur	Fair, 7-15 miles	Hot, over 80°F (27 C)	Cloudy, 20% to 70%	Moderate, 5 to 15 mph		
	<b>2</b>	- not used -	Poor, under 7 miles	Cold, below 32° F (0 C)	Overcast, over 70%	Strong, over 15 mph (24km/h)		
Examples:	00000 = No problem, good visibility, normal temp, clear, calm wind			12121 = Problems, poor visibility, hot, overcast, moderate wind				

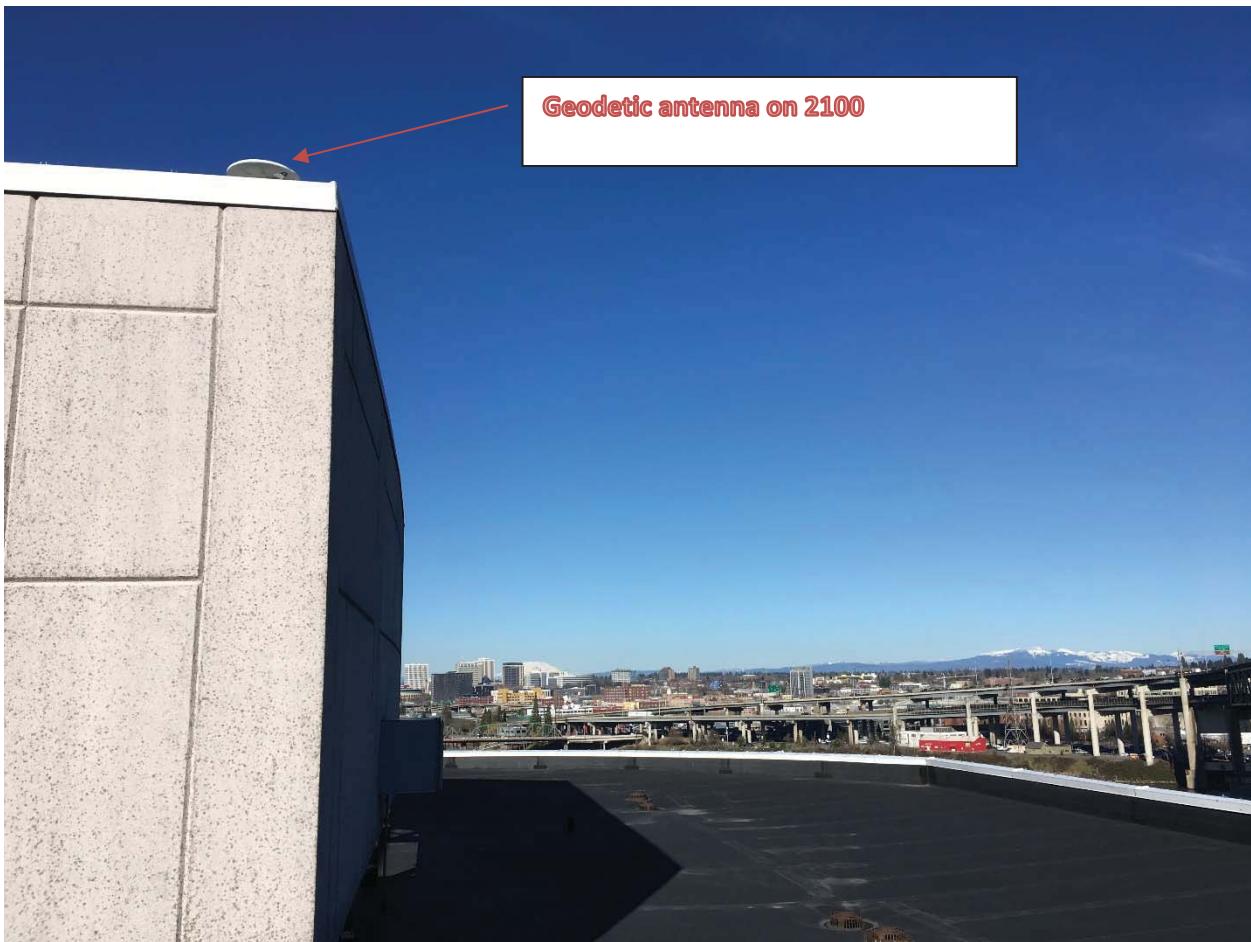
## Photo of Monument 2100



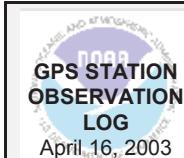
## Photo of Monument 2100



## GNSS Setup on 2100

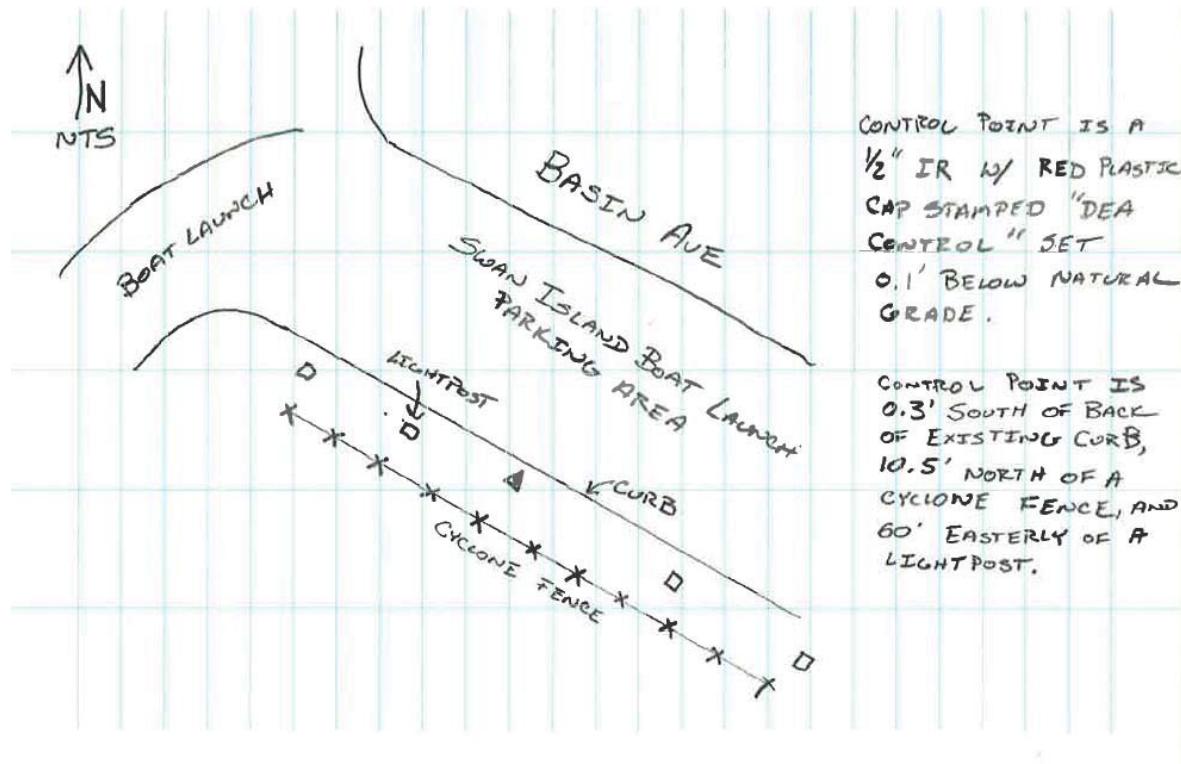


NOTE: This form intended for field use. Unsolicited data submitted to NGS must be converted to bluebook format.



Station Designation: (check applicable: FBN CBN PAC SAC BM) <b>Portland Harbor 1 (PH1)</b>		Station PID, if any:	Date (UTC): <b>06-Mar-18</b>				
General Location: <b>Swan Island Boat Launch</b>		Station 4-Character ID:	Day of Year: <b>065</b>				
Project Name: <b>Portland Harbor - AETR00000034</b>		Project Number: <b>GPS-</b>	Station Serial # (SSN): Session ID:(A,B,C etc)				
NAD83 Latitude o °      "      NAD83 Longitude o °      "      NAD83 Ellipsoidal Height meters NAVD88 Orthometric Ht. meters GEOID99 Geoid Height meters	Agency Full Name: <b>David Evans and Associate, Inc.</b> Operator Full Name: <b>David T. Moehl</b> Phone #: ( ) <b>(360) 314-3200</b> e-mail address: <b>dtm@deainc.com</b>						
Observation Session Times (UTC): Sched. Start _____ Stop _____ Actual Start <b>19:30</b> Stop <b>21:32</b>	Epoch Interval= <b>1</b> Seconds Elevation <b>10</b> Degrees Mask = <b>10</b> Degrees						
Receiver Brand & Model: <b>Trimble SPS985</b> 82500-60 P/N: <b>5616F59510</b> S/N: Firmware Version: <b>5.30</b> <input type="checkbox"/> CamCorder Battery, <input type="checkbox"/> 12V DC, <input type="checkbox"/> 110V AC, <input checked="" type="checkbox"/> Other	Antenna Code*, Brand & Model: <b>Trimble SPS985 Internal</b> P/N: S/N: Cable Length, meters: <b>n/a</b> Vehicle is Parked <b>10</b> meters <b>N</b> (direction) from antenna.	Antenna plumb before session? <input checked="" type="checkbox"/> / <input type="checkbox"/> N Circle Antenna plumb after session? <input checked="" type="checkbox"/> / <input type="checkbox"/> N Yes or No Antenna oriented to true North? <input type="checkbox"/> / <input checked="" type="checkbox"/> N -If no, Weather observed at antenna ht. <input type="checkbox"/> / <input checked="" type="checkbox"/> N explain Antenna ground plane used? <input type="checkbox"/> / <input checked="" type="checkbox"/> N  Antenna radome used? <input type="checkbox"/> / <input checked="" type="checkbox"/> N If yes, Eccentric occupation (>0.5 mm)? <input type="checkbox"/> / <input checked="" type="checkbox"/> N describe. Any obstructions above 10°? <input type="checkbox"/> / <input checked="" type="checkbox"/> N Use Radio interference source nearby <input type="checkbox"/> / <input checked="" type="checkbox"/> N Vis. form					
Tripod or Antenna Mount: Check one: <input checked="" type="checkbox"/> Fixed-Leg Tripod, <input type="checkbox"/> Collapsible-leg tripod <input type="checkbox"/> Fixed Mount Brand & Model: <b>Seco fixed height</b> P/N: S/N: <b>5115-00-FLY</b> Last Adjustment date: <b>2018-03-05</b>	<b>** ANTENNA HEIGHT **</b>		Before Session Begins: Meters      Feet	After Session Ends: Meters      Feet			
A= Datum point to Top of Tripod (Tripod Height)		2.000		2.000			
B=Additional offset to ARP if any (Tribrach/Spacer)		0.000		0.000			
H= Antenna Height = A + B = Datum Point to Antenna Reference Point (ARP)		2.000	6.56	2.000			
Meters = Feet x (0.3048) Height Entered Into Receiver = <b>2.000</b>		Note &/or sketch ANY unusual conditions. Height Entered Into Receiver = <b>2.000</b> meters. Be Very Explicit as to where and how Measured!					
Barometer (if used) Brand & Model:  S/N:	Weather Data	Weather Codes	Time (UTC)	Dry-Bulb Temp Fahrenheit Celsius	WetBulb Temp Fahrenheit Celsius	Rel. % Humidity	Atm. Pressure inches Hg millibar
	Before	00000	19:30				
	Middle						
	After	00000	21:32				
Remarks, Comments on Problems, Sketches, Pencil Rubbing, etc:  Control point is a 1/2" iron rod with red plastic cap stamped "DEA CONTROL" set 0.1' below natural grade. Control point is 0.3' south of the back of curb, 10.5' north of a cyclone fence and 60' easterly of the 2nd light post east of the boat ramp. See detached sketch and photos.							
Weather codes are required. Weather data are optional but encouraged. *Antenna code comes from ant_info file furnished by project coordinator.							
Data File Name(s): <b>95100650.T02</b> (Standard NGS Format = aaaaddds.xxx) where aaa=4-Character ID, ddd=Day of Year, s=Session ID, xxx=file dependant extension				Updated Station Description: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Visibility Obstruction Form: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Photographs of Station: <input checked="" type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Pencil Rubbing of Mark: <input type="checkbox"/> Attached			LOG CHECKED BY: <b>Jon Dasler</b>
Table of Weather Codes  Examples:	CODE	PROBLEM	VISIBILITY	TEMPERATURE	CLOUD COVER	WIND	
	<b>0</b>	did not occur	Good, over 15 miles	Normal, 32° F- 80° F	Clear, below 20%	Calm, under 5mph (8km/h)	
	<b>1</b>	did occur	Fair, 7-15 miles	Hot, over 80°F (27 C)	Cloudy, 20% to 70%	Moderate, 5 to 15 mph	
	<b>2</b>	- not used -	Poor, under 7 miles	Cold, below 32° F (0 C)	Overcast, over 70%	Strong, over 15 mph (24km/h)	
00000 = No problem, good visibility, normal temp, clear, calm wind				12121 = Problems, poor visibility, hot, overcast, moderate wind			

## Sketch of Monument PH1



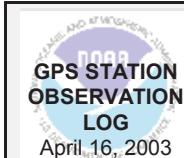
### **Photo of Monument PH1**



### **GNSS Setup on PH1**



NOTE: This form intended for field use. Unsolicited data submitted to NGS must be converted to bluebook format.



Station Designation: (check applicable: FBN CBN PAC SAC BM) <b>Raindeer</b>		Station PID, if any:	Date (UTC): <b>06-Mar-18</b>				
General Location: Airport ID, if any: <b>Sauvie Island, Willamette River</b>		Station 4-Character ID:	Day of Year: <b>065</b>				
Project Name: <b>Portland Harbor - AETR00000034</b>		Project Number: <b>GPS-</b>	Station Serial # (SSN): Session ID:(A,B,C etc)				
NAD83 Latitude o °      "      NAD83 Longitude o °      "      NAD83 Ellipsoidal Height meters NAVD88 Orthometric Ht. meters GEOID99 Geoid Height meters	Observation Session Times (UTC): Sched. Start _____ Stop _____ Actual Start <b>17:38</b> Stop <b>23:45</b> Epoch Interval= <b>1</b> Seconds Elevation <b>10</b> Degrees Mask = <b>10</b> Degrees	Agency Full Name: <b>David Evans and Associates, Inc.</b> Operator Full Name: <b>David T. Moehl</b> Phone #: ( ) <b>(360) 314-3200</b> e-mail address: <b>dtm@deainc.com</b>					
Receiver Brand & Model: <b>Trimble SPS855</b> P/N: <b>69855-60</b> S/N: <b>5506R0074</b> Firmware Version: <b>5.30</b> <input type="checkbox"/> CamCorder Battery, <input checked="" type="checkbox"/> 12V DC, <input type="checkbox"/> 110V AC, <input type="checkbox"/> Other	Antenna Code*, Brand & Model: <b>Trimble Zephyr 3 Base</b> P/N: <b>115000-00</b> S/N: <b>1551129193</b> Cable Length, meters: <b>10</b> Vehicle is Parked <b>n/a</b> meters (direction) from antenna.	Antenna plumb before session? <input checked="" type="checkbox"/> / <input type="checkbox"/> N Circle Antenna plumb after session? <input checked="" type="checkbox"/> / <input type="checkbox"/> N Yes or No Antenna oriented to true North? <input checked="" type="checkbox"/> / <input type="checkbox"/> N -If no, Weather observed at antenna ht. <input checked="" type="checkbox"/> / <input type="checkbox"/> N explain Antenna ground plane used? <input checked="" type="checkbox"/> / <input type="checkbox"/> N  Antenna radome used? <input checked="" type="checkbox"/> / <input type="checkbox"/> NY If yes, Eccentric occupation (>0.5 mm)? <input checked="" type="checkbox"/> / <input type="checkbox"/> N describe. Any obstructions above 10°? <input checked="" type="checkbox"/> / <input type="checkbox"/> N Use Radio interference source nearby <input checked="" type="checkbox"/> / <input type="checkbox"/> N Vis. form					
Tripod or Antenna Mount: Check one: <input checked="" type="checkbox"/> Fixed-Leg Tripod, <input type="checkbox"/> Collapsible-leg tripod <input type="checkbox"/> Fixed Mount Brand & Model: <b>Seco fixed height</b> P/N: S/N: <b>5115-00-FLY</b> Last Adjustment date: <b>2018-03-05</b>	<b>** ANTENNA HEIGHT **</b>		Before Session Begins: Meters      Feet	After Session Ends: Meters      Feet			
A= Datum point to Top of Tripod (Tripod Height)		2.000		2.000			
B=Additional offset to ARP if any (Tribach/Spacer)		-0.003		-0.003			
H= Antenna Height = A + B = Datum Point to Antenna Reference Point (ARP)		1.997	6.55	1.997	6.55		
Meters = Feet x (0.3048) Height Entered Into Receiver = <b>2.000</b> meters. Be Very Explicit as to where and how Measured! Note &/or sketch ANY unusual conditions.							
Barometer (if used) Brand & Model: S/N:	Weather Data	Weather Codes	Time (UTC)	Dry-Bulb Temp Fahrenheit Celsius	WetBulb Temp Fahrenheit Celsius	Rel. % Humidity	Atm. Pressure inches Hg millibar
	Before	00000	17:38				
	Middle						
	After	00000	23:45				
Remarks, Comments on Problems, Sketches, Pencil Rubbing, etc:							
Weather codes are required. Weather data are optional but encouraged.				*Antenna code comes from ant_info file furnished by project coordinator.			
Data File Name(s): <b>00740650.T02</b> (Standard NGS Format = aaaaddds.xxx) where aaa=4-Character ID, ddd=Day of Year, s=Session ID, xxx=file dependant extension				Updated Station Description: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Visibility Obstruction Form: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Photographs of Station: <input checked="" type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Pencil Rubbing of Mark: <input type="checkbox"/> Attached			LOG CHECKED BY: <b>Jon Dasler</b>
Table of Weather Codes Examples:	CODE	PROBLEM	VISIBILITY	TEMPERATURE	CLOUD COVER	WIND	
	<b>0</b>	did not occur	Good, over 15 miles	Normal, 32° F- 80° F	Clear, below 20%	Calm, under 5mph (8km/h)	
	<b>1</b>	did occur	Fair, 7-15 miles	Hot, over 80°F (27 C)	Cloudy, 20% to 70%	Moderate, 5 to 15 mph	
	<b>2</b>	- not used -	Poor, under 7 miles	Cold, below 32° F (0 C)	Overcast, over 70%	Strong, over 15 mph (24km/h)	
00000 = No problem, good visibility, normal temp, clear, calm wind				12121 = Problems, poor visibility, hot, overcast, moderate wind			

Photo of Monument RAINDEER



### **Photo of Monument RAINDEER**



## GNSS Setup on RAINDEER



## **APPENDIX B – Standard Operating Procedures**

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B-2. Surface Sediment Sampling (Integral 2004)

## **SURFACE SEDIMENT SAMPLING AND PROCESSING**

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The purpose of this standard operating procedure (SOP) is to define and standardize the methods for collecting surface sediment samples from freshwater or marine environments. For the purpose of this SOP, surface sediments are defined as those from 0 to at most 30 cm below the sediment-water interface. The actual definition of surface sediments is typically program-specific and is dependent on the purpose of the study and the regulatory criteria (if any) to which the data will be compared.

This SOP utilizes and augments the procedures outlined in Puget Sound Estuary Program (PSEP 1996) guidelines. A goal of this SOP is to ensure that the highest quality, most representative data be collected, and that these data are comparable to data collected by different programs that follow PSEP guidelines.

## **SUMMARY OF METHOD**

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Sediment samples for chemical and toxicity analysis are collected using a surface sediment sampling device (e.g., grab sampler). If a sample meets acceptability guidelines, overlying water is siphoned off the surface and the sediment is described in the field log. Sediment samples for chemical analysis may be collected directly from the sampler (e.g., volatile organic compounds and sulfides) or sediment from the sampler may be homogenized using decontaminated, stainless-steel containers and utensils prior to being placed in sample jars. Sediment from several sampler casts may also be composited.

## **SUPPLIES AND EQUIPMENT**

---

A generalized supply and equipment list is provided below. Additional equipment may be required depending on project requirements.

- Sampling device:  
Grab sampler or box corer
- Field equipment:  
Siphoning hose  
Stainless-steel bowls or containers  
Stainless-steel spoons, spatulas, and/or mixer  
Decontamination supplies  
(Alconox™ detergent, 0.1 N nitric acid, methanol dionized water)  
Personal protective equipment for field team  
(rain gear, safety goggles, hard hats, nitrile gloves)  
First Aid kit  
Cell phone

Sample containers  
Bubble wrap  
Sample jar labels  
Clear tape  
Permanent markers  
Pencils  
Coolers  
Ice

- Documentation
  - Waterproof field logbook
  - Field sampling plan
  - Health and safety plan
  - Correction forms
  - Request for change forms
  - Waterproof sample description forms

## **PROCEDURES**

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### **EQUIPMENT DECONTAMINATION**

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The basic procedure used most commonly in Integral field projects to decontaminate field sampling equipment is as follows:

1. Rinse with tap or vessel water.
2. Wash with brush and Alconox™ detergent.
3. Rinse with tap or vessel water.
4. Rinse with distilled water.
5. Rinse with 0.1 N Nitric acid (optional - if metals analysis is to be performed).
6. Rinse with methanol or hexane (optional - if organics analysis is to be performed or adhering petroleum residue present).
7. Rinse with distilled water.
8. Cover with aluminum foil (dull side down).

This procedure may be modified depending on site-specific requirements, as described in PSEP (1986). For example, if sampling is in areas known to be uncontaminated or only slightly contaminated, the solvent and/or acid rinses may be eliminated. Conversely, if creosote or other petroleum-based residue is encountered, a hexane rinse may be added.

Decontamination with acid or solvents should always be performed outdoors using appropriate protective equipment, including, at a minimum, chemical-resistant gloves (e.g., nitrile) and goggles. All decontamination liquids that include solvents or acids should be contained in tightly sealed buckets or other containers for disposal in an approved onshore facility. Alternatively, low-vapor pressure solvents may be evaporated in a well-ventilated open area away from the work zone.

## **SEDIMENT SAMPLE COLLECTION**

---

To collect sediment for chemical and biological analyses, a sampler that obtains a quantifiable volume of sediment with minimal disturbance of the sediments must be employed. Additionally, the sampler should be composed of a material such as stainless steel or aluminum, or have a non-contaminating coating such as Teflon<sup>TM</sup>. Samplers capable of providing high-quality sediment samples include grab-type samplers (van Veen, Smith-McIntyres, Young grab, power-grab and ponar grab) and box cores (Soutar, mini-Soutar, Gray-O'Hara, spade core). Some programs require a sampler that collects from a specific area (e.g., 0.1 m<sup>2</sup>). Most sampling devices are typically a standard size; however, some non-standard sizes are available to meet the requirements of specific programs. Grab samplers, especially the van Veen grab, are the most commonly used samplers to collect surface sediment. Power grab samplers are often used for programs requiring collection of sediment deeper than 10 cm or in areas with debris.

A hydraulic winch system should be used to deploy the sampler at a rate not exceeding 1 m/sec to minimize the bow wake associated with sampler descent. Once the sampler hits the bottom, the jaws are slowly closed and the sampler is brought to the deck of the vessel at a rate not exceeding 1 m/sec to minimize any washing and disturbance of the sediment within the sampler. At the moment the sampler hits the bottom, the time, depth, and location of sample acquisition are recorded in the field logbook.

Once onboard, the sampler is secured, any overlying water is carefully siphoned off, and the sample is inspected to determine acceptability. Criteria used to determine acceptability are those detailed in PSEP (1986), except when noted in the project-specific field sampling plan (FSP). These criteria include but are not limited to:

- There is minimal or no excessive water leakage from the jaws of the sampler.
- There is no excessive turbidity in the water overlying the sample.
- The sampler is not over-penetrated.

- The sediment surface appears to be intact with minimal disturbance.
- The program-specified penetration depths are attained.

If the sample meets acceptability criteria, the sample is recorded and observations entered into a sample description form or log. Once the sample has been characterized, the sediment is then sub-sampled for chemical and biological analyses.

## SAMPLE PROCESSING

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Sediment for chemical and/or toxicity analyses is removed from the sampler using a stainless-steel spoon. Depending on programmatic goals, the upper 2 to 30 cm of sediment are removed. To prevent possible cross contamination, sediments touching the margins of the sampler are not used.

Samples for volatile compounds (either organics or sulfides) are collected using a decontaminated stainless-steel spoon while sediment is still in the sampler. These sediments are not homogenized. The volatile organics sample jar should be tightly packed with sediment (to eliminate obvious air pockets) and filled so that there is no headspace remaining in the jar. Alternatively, if there is adequate water in the sediment, the container may be filled to overflowing so that a convex meniscus forms at the top, and the cap carefully placed on the jar. Once sealed, there should be no air bubbles. The sulfides sample is preserved with 0.2 N zinc acetate.

The remaining sediment is then placed into a pre-cleaned, stainless-steel bowl. Typically, sediment from a minimum of three separate casts of the sampler is composited at each station. Once a sufficient amount of sediment has been collected, the sediment is homogenized until it is of uniform color and has obtained a smooth consistency. It is then dispensed into pre-cleaned sample jars for the various chemical or biological analyses. Sample jars for biological analyses should be filled to the top with sediment to minimize available headspace. This procedure will minimize any oxidation reactions within the sediment. Sample jars for chemical analysis may be frozen for storage, leaving enough headspace left in the container to allow for expansion of the sediment upon freezing. After dispensing the sediment, the containers are then placed into coolers with ice and are either shipped directly to the analytical laboratories or transported to a storage facility.

## **CHAIN-OF-CUSTODY**

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### **Field**

The cruise leader or other designated field sample custodian is responsible for all sample tracking and chain-of-custody procedures until sample custody is transferred to the laboratory. Custody procedures in the field are as follows:

1. Record all field and sample collection activities (including sample identification number, collection time and date) in the field logbook. While being used in the field, the logbook remains with the field team at all times. Upon completion of the sampling effort, the logbook should be reproduced and then kept in a secure area.
2. Complete a chain-of-custody form whenever samples are being transferred or removed from the custody of field sampling personnel. A sample form is provided in Appendix B. Record each individual sample on the form. Include additional information to assist in sample tracking such as collection date and time, number of containers, and sample matrix. The chain-of-custody may also serve as the sample analysis request form, with the required analysis indicated for each individual sample.
3. Sign the form and ensure that the samples are not left unattended unless secured.
4. Store, pack, or ship samples as described in the following section. Place the original completed chain-of-custody form in a sealed plastic bag inside the shipping container. A copy is retained by the shipping party.
5. Complete a separate custody form for each individual shipping container or a single form for all samples in multiple shipping containers in a single shipment, with the number of containers noted on the custody form.
6. Attach completed custody seals to any shipping container that will be sent to the laboratory by delivery service or courier. Delivery personnel are not required to sign the custody form if custody seals are used. Custody seals are used to detect unauthorized tampering with the samples. Gummed paper or tape should be used so that the seal must be broken when the container is opened. The laboratory sample custodian (or other sample recipient) will establish the integrity of the seals.

7. The laboratory custodian (or other sample recipient) acknowledges receipt of the samples by signing, dating, and noting the time of transfer on the chain-of-custody form. The condition of the samples and any problems or irregularities (e.g., cracked or broken jars, loose lids, evidence of tampering) should also be recorded. Return a copy of the completed custody form to the project manager or designated sample coordinator.

## **Laboratory**

The laboratory will designate a sample custodian who is responsible for receiving samples and documenting their progress through the laboratory analytical process. Each custodian will ensure that the chain-of-custody and sample tracking forms are properly completed, signed, and initialed on transfer of the samples. Specific laboratory chain-of-custody procedures should be in writing, included in the laboratory QA plan, and approved prior to beginning sampling and analysis. Laboratory custody procedures should include the following:

- A designated laboratory person initiates and maintains a sample tracking log that will follow each sample through all stages of laboratory processing and analysis.
- The laboratory tracking log includes, at a minimum, the sample number, location and type of storage, date and time of each removal, and signature of the person removing or returning the sample.
- The final disposition of the sample is recorded.

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## **CHAIN-OF-CUSTODY QUALITY CONTROL PROCEDURES**

Complete and correct chain-of-custody is essential to ensure and demonstrate sample integrity. Errors in entering information or transferring custody can result in analytical or data reporting errors. Inaccuracies or errors in sample tracking and custody records can compromise data usability, particularly as legal evidence.

Quality control procedures include the following:

- Allow adequate time to take accurate and complete field records and to carefully complete chain-of-custody forms.
- When possible, work in pairs or more to complete the chain-of-custody form and check for accurate information entry.

- Complete all custody records in ink; errors should be neatly crossed out and corrected and initialed by the person making the change.
- Immediately notify the project manager of any deviation from required custody procedures.

## **PACKING AND SHIPPING SAMPLES**

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Environmental samples are packed in a manner to reduce the chance of sample breakage, ensure sample integrity, and prevent material leakage and potential exposure to hazardous materials in the event of breakage. Samples are placed in sealed plastic bags and packed in a sturdy container with adequate packing material to prevent breakage. Ice or dry ice may be included to maintain sample storage conditions. Samples are transported by field personnel or shipped via courier or common carrier. Shipping procedures are in accordance with U.S. Department of Transportation regulations (49 CFR 173.6 and 49 CFR 173.24).

All preserved samples should be shipped as soon as possible after completion of sampling. This minimizes the number of people handling samples and protects sample quality and security.

### **Sample Packing**

Upon completion of final sample inventory by the field sample custodian and completion of chain-of-custody, samples are packed as follows:

1. If not already done after sample collection, wipe the outside of each sample container and lid with a disposable cloth to remove any soil or sediment adhering to the outside of the jar and place each container in a sealed plastic bag (e.g., ziplock).
2. Wrap each glass sample container in bubble wrap or place it in a bubble wrap plastic bag. [Note: When samples are being transported by field personnel directly from the field site to the laboratory (thereby ensuring careful handling), this step is recommended but may be omitted. However, this step is required when a courier or delivery service is transporting the samples.]
3. Line the shipping container with heavy-duty plastic bags (e.g., garbage bags) and bubble wrap. Use a leak-proof, sturdy container that can withstand rough treatment during shipping. If ice chests or coolers are used, the drain should be securely plugged and sealed with duct tape.

4. Place the samples tightly in the shipping container:
  - Use dividers or bubble wrap to separate all glass containers
  - Fill any empty space in the shipping cooler or box with packing material so that the jars are held securely.
5. Place the original completed chain-of-custody form in a sealed plastic bag and place it inside the shipping container. If using a cooler or ice chest, the form should be securely taped to the inside of lid.
6. For liquid samples, absorbent material (e.g., vermiculite) should be placed in the container in sufficient quantity such that all liquid could be absorbed.
7. Tie or seal the bag lining the shipping container.
8. If required to meet sample storage requirements, fill the ice chest with crushed or block ice, blue ice (refrigerated samples, 4°C) or dry ice (frozen samples). A temperature blank (provided by the laboratory) should be packed in each cooler.
9. If samples for volatile organics analysis (VOA) are included in the shipping container, two VOA trip blanks (provided by the analytical laboratory) should also be packed in the cooler.
10. Seal shipping container securely with packing or duct tape.
11. If the shipping container will be transported by anyone other than the person who completed and signed the chain-of-custody form, attach completed custody seals so that the shipping container cannot be opened without breaking the seal.
12. Attach a *This End Up* label to each side of the shipping container to ensure that jars are transported in an upright position. A *Fragile* label may also be attached to reduce rough handling of the samples.
13. Label the shipping container with all appropriate information (name of project, time and date, responsible person and company name, address and phone) to enable positive identification.

## **Sample Shipping**

Packed containers may be delivered to the laboratory or storage facility by field personnel, courier, or common carrier (FedEx, UPS). However, any outside carrier or courier service must provide a delivery receipt. The carrier or courier must also ensure delivery time if holding time and storage conditions are critical.

Unless arranged in advance, shipping charges should be prepaid by sender to avoid confusion and possible rejection of the package by the laboratory.

The adequacy of handling and shipping procedures is reflected in the condition of the samples upon receipt by the laboratory:

- No jars are cracked or broken.
- There is no evidence of sample leakage.
- Measuring the temperature of the temperature black indicates that correct storage conditions have been maintained.

The sample custodian or other designated person is responsible for confirming that copies of all shipping documents, completed in full and correctly, are on file at Integral.

## **QUALITY CONTROL PROCEDURES**

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Field quality control (QC) samples that may be collected during surface sediment sampling are the same as for any field sampling program. The types and frequency of field QC sample collection are project-specific and will be described in the project field sampling plan. The most commonly collected field QC sample are described below (PSEP 1996):

- **Field Blank.** A field blank is a sample of analyte-free water that is supplied by the laboratory. The field blank is generated by transferring the analyte-free water to another laboratory-supplied sample container while at the field sampling location. Field blank results are used to measure and document any possible onsite contamination.
- **Field Split Sample.** A field split sample consists of aliquots of the same homogenized sediment sample that are equally distributed in two sets of sample containers. These samples may be analyzed identically or analyzed by different laboratories to evaluate repeatability of sample handling and analytical procedures, sample heterogeneity, and analytical procedures.
- **Field Replicate.** A field replicate consists of a second sample that is collected using the same sampling methodology used to obtain the first sample. It is collected at the same sampling location and as soon after the original sample as possible. Analysis of the field replicate allows evaluation of the repeatability of field sampling methodologies, as well as the heterogeneity of the sample matrix. Statistical analysis of multiple replicates may also be used to calculate the likely range of an analyte concentration at a given sampling location.

## **REFERENCES**

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PSEP. 1996. Puget Sound Estuary Program: Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound. Final Report. TC-3991-04. Prepared for U.S. Environmental Protection Agency, Region 10 and Puget Sound Estuary Program, Seattle, WA. Tetra Tech and HRA, Inc., Bellevue, WA.

## **APPENDIX B – Standard Operating Procedures**

### **B-3. Management of IDW**

# **STANDARD OPERATING PROCEDURE SOP-02**

## **MANAGEMENT OF INVESTIGATION-DERIVED WASTE**

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### **Introduction**

Investigation derived wastes (IDW) generated during the Pre-Remedial Design Investigations at the Portland Harbor Superfund Site may include:

- Soils/sediments
- Surface water
- Other materials:
  - Personal protective equipment
  - Disposable sampling equipment
  - Spent decontamination liquids
  - Plastic sheeting, containers, etc.

The management of these wastes will be conducted to limit exposure of Site personnel to hazardous materials, and to prevent introduction of contaminated materials to uncontaminated environmental media at the Site (soils, sediment). The following Standard Operating Procedures (SOPs) establish protocols for testing, storage, and disposal of these materials.

Disposal of laboratory test equipment and supplies will be handled in accordance with the laboratory Quality Assurance Project Plan (QAPP).

### **General**

IDW management will follow guidance described in the Office of Solid Waste and Emergency Response (OSWER) document, Guide to Management of Investigation-Derived Wastes (United States Environmental Protection Agency [EPA] 1992). This guidance discusses factors to consider as part of an IDW management program. These factors include protectiveness of human health and the environment, compliance with applicable and relevant or appropriate requirement (ARAR)-based cleanup levels, land disposal restrictions, storage requirements, recordkeeping and manifesting, and handling of non- Resource Conservation and Recovery Act (RCRA) hazardous wastes. The IDW management program described in this section incorporates these factors in the program.

All IDW identified as potentially contaminated with hazardous materials will be stored in a designated and clearly marked IDW management area located at the AECOM Technical Services (AECOM) Field Laboratory. All vessels will also be clearly labeled to indicate the source of the IDW. The IDW storage area will be inspected daily to ensure that storage procedures (as outlined below) are being followed. Any violations of these procedures will be

documented and remedied as quickly as possible. Potentially contaminated IDW will be identified based on its origin, olfactory evidence, and visual evidence. Laboratory testing will be required to determine the proper disposition of these IDW.

## **Media Specific IDW Management**

### *Sediment/Soils*

Waste soils and sediments will be generated as excess sample material. The required testing and handling of this IDW will depend on its origin and characteristics. Olfactory and visual observations will be used to determine if the soils contain potentially elevated levels of hazardous materials. The amount of sediment generated will be minimized to the volume necessary for sampling and analysis, if possible. During field operations, leftover sediment material will be returned to the location it was generated from unless a significant sheen or non-aqueous phase liquid (NAPL) is observed. If significant sheen or NAPL is observed, sediment on the vessel or laboratory processing area will be temporally stored in 5-gallon buckets with lids, then transferred to 55-gallon drums. Each drum will be labeled using a grease pencil or paint pen to indicate the date sealed, location, and contents. Each of the sealed drums will then be staged at a designated solid waste management unit location for later disposal characterization.

### *Surface Water*

Sampling activities may result in the creation of surface water sheens. Sorbent booms will be deployed if significant sheen is encountered on the water surface during coring/grab sampling. A small support boat may be used to manage the boom so the sampling vessel can operate without interruption. AECOM will coordinate with the Office of Spill Prevention Section on additional mitigation measures and agency notifications for releases. Surface water generated during sediment collection will be returned to the lake unless a significant sheen is observed. If a sheen is observed, water will be contained in 55-gallon drums or plastic containers and managed accordingly.

### *Personal Protective Equipment (PPE)*

Investigation-derived PPE consists of gloves, chemically protective clothing, respirator canisters, and other one-time use equipment used during the field investigation. All used PPE will be containerized in plastic garbage bags and disposed of on-site for subsequent transport to the municipal landfill.

### *Decontamination Fluids*

Decontamination fluids will be drummed up in either 55-gallon drums or disposed of in sanitary sewers if no significant sheen is observed. Alconox used on the boat will be discarded overboard if no significant sheen is observed. The decontamination containers will be kept on-site until the water has been analyzed for hazardous materials, at which time the water will be discarded appropriately.

### *Chemical Liquid Wastes*

Chemical liquid wastes will include the spent solvents and acids and other residual chemicals generated during the decontamination process.

Waste acids and solvents will be collected in (dedicated) satellite containers as follows:

- Waste acids (e.g., hydrogen chloride, nitric acid) will be collected in a plastic storage carboy (20-L) SEPARATE FROM WASTE SOLVENTS, labeled with a Class 8 Corrosive Liquid label and containing a tag that indicates acid name, concentration, and volume along with users' initials and date/time.
- Waste solvents (e.g., acetone, methanol, and hexane) will be collected in Type I or II UL-approved galvanized steel disposal can, SEPARATE FROM WASTE ACIDS, labeled with a Class 3 Flammable Liquid label and containing a tag that indicates solvent name, concentration, and volume along with users' initials and date/time.

### *Solvent Waste (Acetone, Methanol, Hexane)*

- Assign a unique identification number to the Type I or II UL-approved steel disposal can (clearly marked on the top and sides).
- Prepare a log for the drum, listing the volume and concentration of each solvent transferred to the drum along with date/time.
- Place a label indicating that the drum contains IDW pending characterization and a Class 3 Flammable Liquid label on the drum.
- Close the drum after each transfer.
- Store the drum in a secure area at the field facility until pickup by an authorized waste handler at the end of the field phase. Drums containing hazardous waste will be removed from the facility within the time mandated for the governing hazardous waste generator status (large quantity generator, small quantity generator, or conditionally except generator).

### *Other Materials*

All plastic sheeting, sampling containers, and other disposable equipment that is free from hazardous materials will be containerized in plastic garbage bags and disposed of on-site for subsequent transport to the municipal landfill. Materials that have visible NAPL will also be drummed and shipped off-site for disposal at an approved facility. Non-disposable or bulky materials may be decontaminated and re-used or disposed as solid waste (see SOP for decontamination). Other disposable materials used on-site (tarps covering non-contaminated soils, caution tape, potable water containers) that have not contacted contaminated media will be disposed as solid waste.

## **Testing and Disposal**

All drummed materials will be tested to determine the proper disposal method. Composite samples will be collected from each drum for analysis. Composite samples will be collected such that reasonable likelihood exists that the entire volume of material in a drum is represented in the sample.

Composite samples will be tested for the parameters identified in the QAPP. Modifications of this analyte list may be made based on specific knowledge of the origin and likely contaminants in the materials.

Soils contaminated above hazardous waste criteria will be shipped to a licensed disposal facility following any further required waste characterization or stabilization.

## **References**

United States Environmental Protection Agency (EPA). 1992. Guide to Management of Investigation-Derived Wastes. Office of Solid Waste and Emergency Response. 9345-03FS.

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